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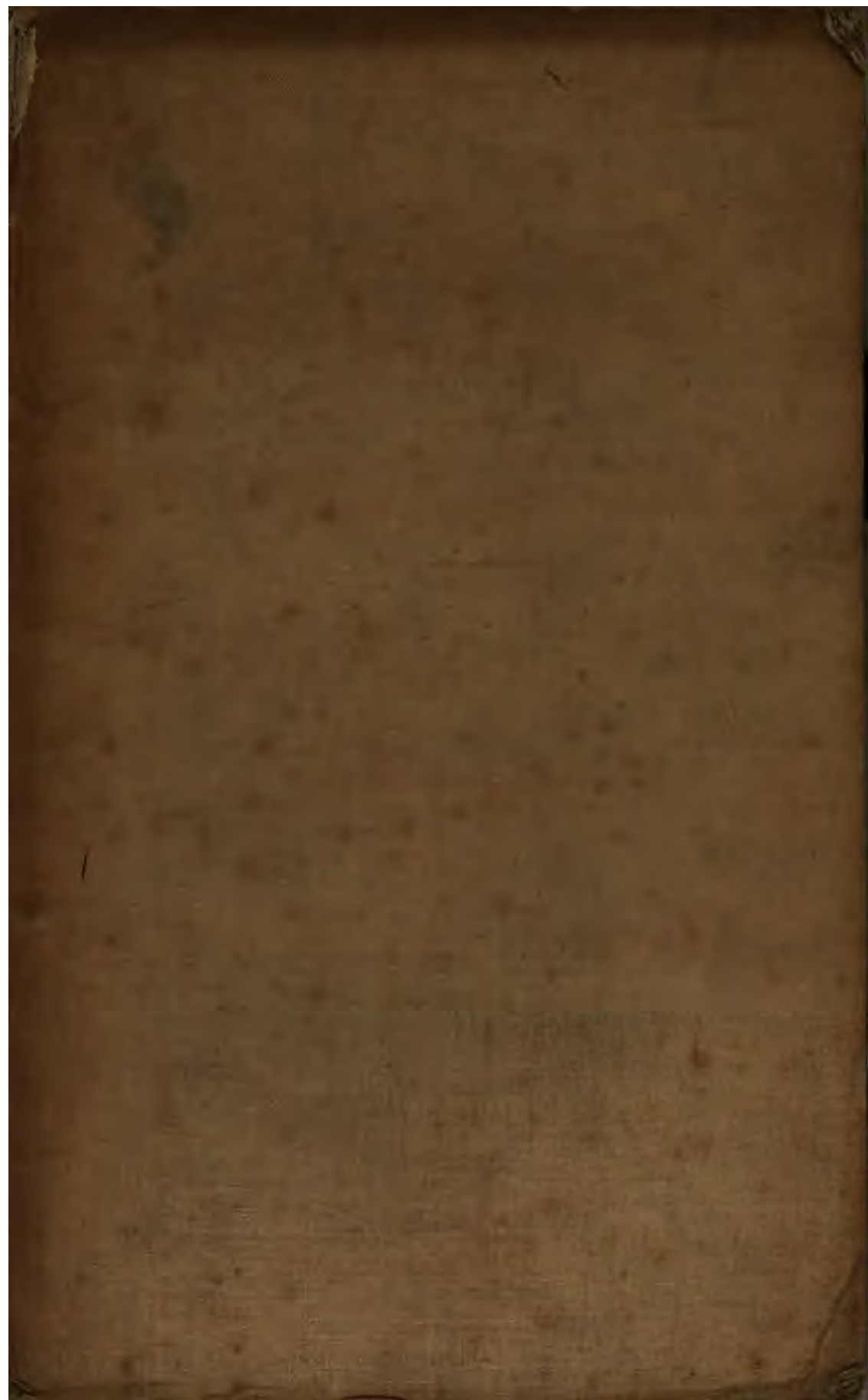
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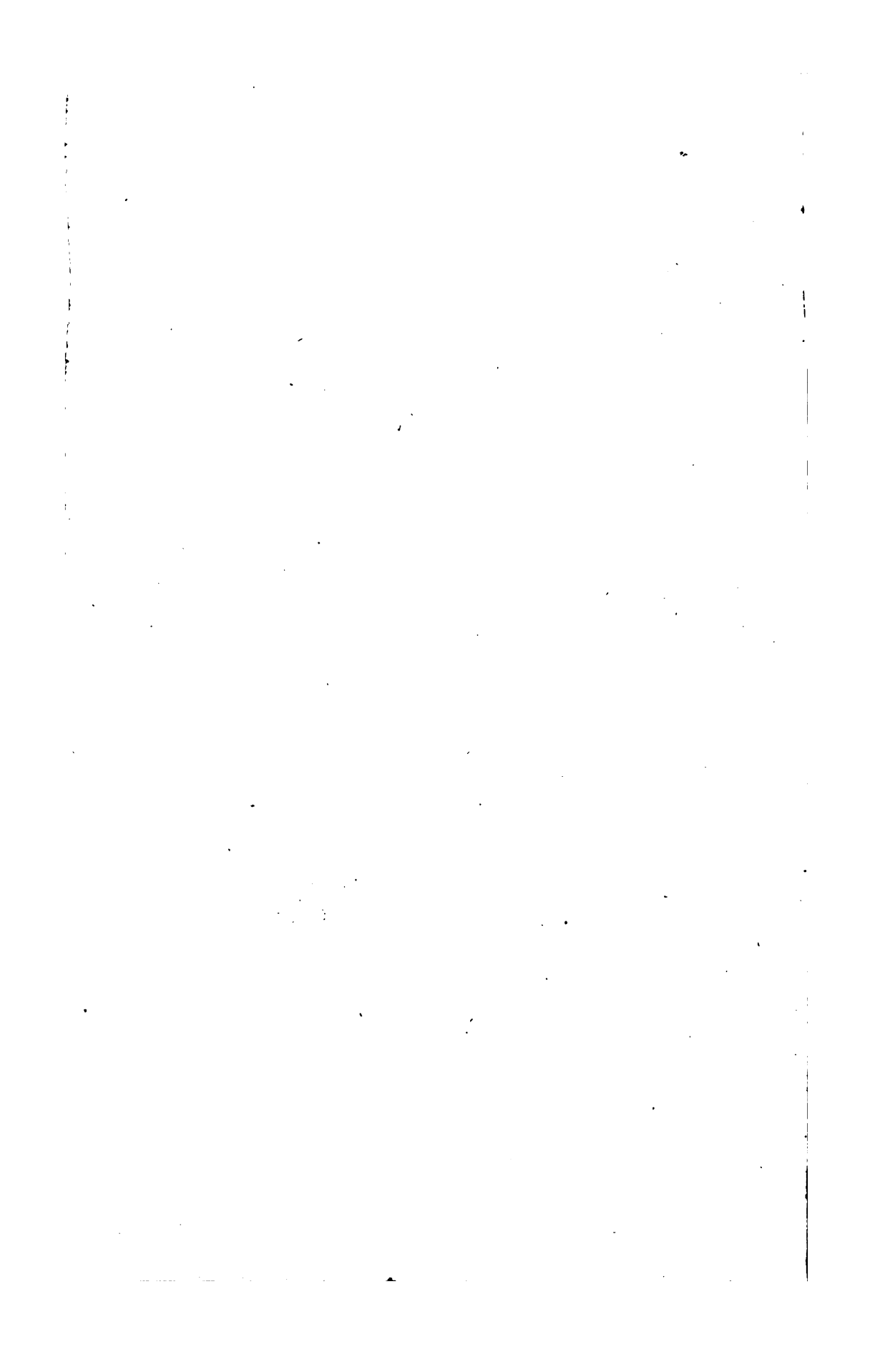
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THE
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AND
JOURNAL OF PATENT INVENTIONS.

VOLUME THIRD,

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EDITED BY L. HEBERT,

CIVIL ENGINEER.

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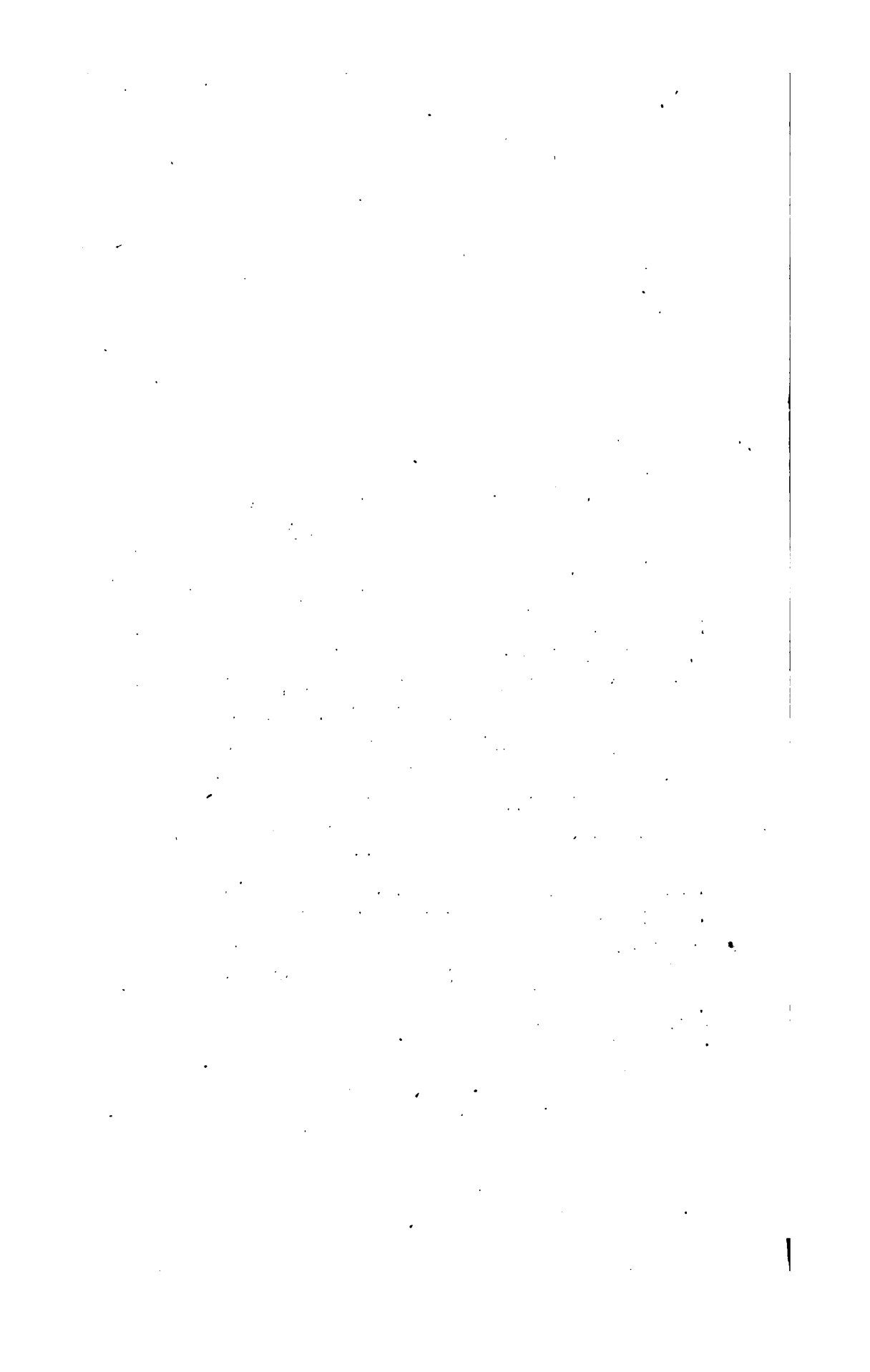
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P R E F A C E.

In completing the *third* volume of the **NEW SERIES**, and the *seventh* of the entire work, the Editor has the gratification to observe (by a comparison of the several indexes) that the information which the present volume contains, is of a more varied, and particularly useful character, than any of its predecessors; and he has the strongest reason for believing, that the succeeding volumes will mark a similar progression in improvement.

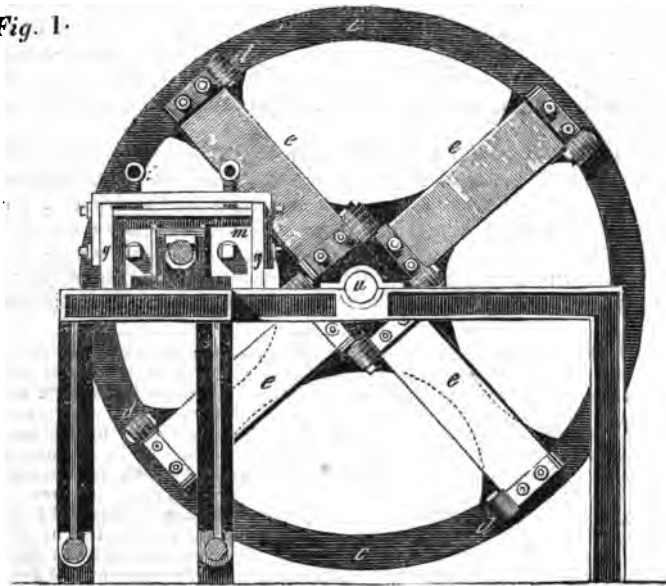
The inconvenience attending the care of weekly periodical publications consisting of loose single sheets of paper, has led to so general a preference being given by subscribers to the monthly form, that it is now proposed to bring out this work in no other form; the Editor has accordingly to announce, that it will in future be published in *parts* only, on the first day of every month.

For the valuable assistance afforded by correspondents, the Editor has to express to them, his deep sense of the obligations conferred; and he indulges a hope, that they will "not be weary in well-doing," but continue to enrich the pages of the work, by the "good fruit" of their talents and experience.



THE
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Fig. 1.



WRIGHT'S PATENT TOBACCO-CUTTING ENGINE.

PATENT TOBACCO CUTTING ENGINE.

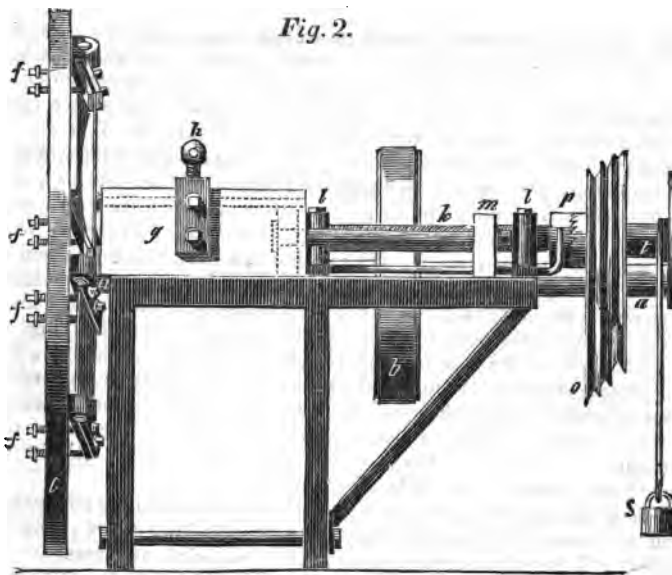
By S. W. WRIGHT, of Lambeth.—*Scaled September, 1828.*

THE versatile talents of Mr. S. W. Wright are well known to the public, from his numerous inventions, possessing (as we have had occasion to shew) various degrees of merit; the present invention may however add a little to his fame, as it will probably answer the purpose intended. The subject of it, that of cutting tobacco, is not one of *general* interest, but the very extraordinary and extensive application of that noisome foreign weed, renders any improvement in the machinery employed in its preparation, an object of some importance with the "manufacturer," the dealer, and the merchant.

Instead of the alternating action of a single knife in rapid motion, Mr. Wright has introduced a series of knives placed as radii to a wheel, which as it revolves cuts the tobacco leaves into shreds. Our readers will perceive that this improvement is precisely of the same nature, as that introduced about 25 years ago in the art of cutting straw; but why Mr. Wright should have selected one of the worst models of those machines for imitation; why he should have preferred the simple *pressure* of the knives to that of giving them a *slicing* motion, we cannot understand. Mr. W. has availed himself before of a hint we gave him in the description of his crane;* and we trust that he will in the present instance avail himself of another, which is to cut his tobacco in the same manner that he cuts his bacon; the chopping system is bad, whether applied to bacon or tobacco, but Mr. Wright's application of rotary choppers instead of the reciprocating, is nevertheless an improvement in the art of cutting tobacco.

Fig. 1, (on the other side) and Fig. 2 annexed, represent two elevations or views of the machine, one being at right angles to the other. *a* is the main axis, set in motion by the drum *b*; *c c* is a fly wheel having hinges *d d*, to which the cutters *e e* are attached by screws, (these are best seen in fig. 1); other screws *f f* are employed to adjust and set the hinges *d d*, so that the cutters shall press close to the front of the box *g*, in which the tobacco is placed;

* Our readers will recollect that when we gave an account of this crane, we were attacked for our observations upon its merits by three of our contemporaries, the *Mechanics' Magazine*, the *Technological Repository*, and the *London Journal*; each of the editors of which, to shew that we were wrong, and to prove that both power and speed were obtained by the machine, promised to furnish the public with a description of it, as soon as the patent was enrolled. It has now been enrolled nearly a year, and no description of it has appeared in either of these works; possibly these editors now comprehend the principle of its action, and may be disposed to let the matter rest. This circumstance was recalled to our recollection by a notice of the invention in the last number of the *Repertory of Patent Inventions*, wherein the editor expresses an opinion precisely the same as that published by us upwards of twelve months ago, in these words, "*we cannot perceive any circumstance in the formation of Mr. Wright's crane, by which labour can in any way be diminished in working them, while at the same time, the great multiplicity of their parts, must cause them to be more liable to derangement, and to be more expensive than other cranes.*"



h h are two screws for pressing the tobacco down ; and *h* a screw, by the turning of which it is pushed forward towards the cutters. This screw is supported in plummer blocks *l l*, and works in a nut fixed in a massive block *m*, from which two strong bars proceed to another block in the box *g*, which presses the tobacco forward by the revolution of the screw. On the axis of the screw is a treble pulley, driven by a cat-gut band from another pulley *o*, on the axis of *a*, which admits of the velocity of the screw being varied according as the tobacco is required to be cut fine or coarse. The treble pulley is made to carry round a screw by a sliding clutch *p* in the axis of the screw, which is kept pressed by a fork lying in grooves in the clutch.

When the box requires a fresh supply of tobacco, the fork is turned back from the clutch, and a weight *s*, which has been wound upon the axis of a winch *t* descends, and turning the screw in the reverse direction brings back the block to the other end of the box *g*.

PATENT CYLINDERS, RETORTS, ORDNANCE, &c.

By JOSHUA HORTON.—*Sealed April, 1828.*

THIS is a method of forming all kinds of large cylinders, as retorts, guns, &c., of wrought iron, or steel, or mixtures of both. A number of bars *a a* are to be bound together by binding hoops *b b*, as shewn in figs. 1 and 3, and placed in a furnace. When they have acquired a welding heat they are to be withdrawn, and hammered together by heavy hammers ; and if necessary, heated again until they are per-

fectly united. The bars should be wedge-shaped, or wider on the outside, than on the side which is to form the interior of the cylinder, but any of the forms shewn in fig. 1 will do. If the cylinder is intended for a cannon, the bars should be thickest at the breech end; and if deemed necessary, the interior may be formed of steel, by placing a layer of steel bars within the iron bars. After the welding is completed, the piece is to be finished by turning and boring; the breech-piece may either be formed in one piece with the rest, or it may be made of a separate piece of wrought iron, and screwed with the gun, as shewn in fig. 4. The trunnions may also be formed in one with the gun; but the patentee recommends that they should be formed in a separate ring, and fastened to the gun, either by a male screw cut upon the gun, and a female screw in the trunnion ring, as seen in fig. 4, or the ring may be keyed into the gun, as shewn in fig. 2. These separate trunnions the patentee represents as possessing great advantages from the facility with which a gun can be rendered useless, when necessary to abandon it to an enemy, by removing the trunnions. We should have stated, that the cylinder should be placed on a mandrill whilst being hammered.

In perusing the specification, we thought we recollected having read of cannons being originally formed in a similar way; but we cannot call to mind any authority on this point at present. In Nicholson's Encyclopedia, it is stated, that it has been proposed to form cannon of hammered iron, and that a beautiful specimen had been sent to the Tower, but which was so very light that it was

Fig. 2.

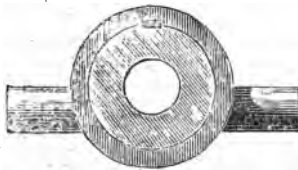


Fig. 1.

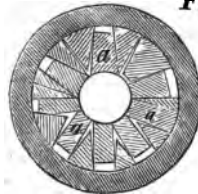


Fig. 3.

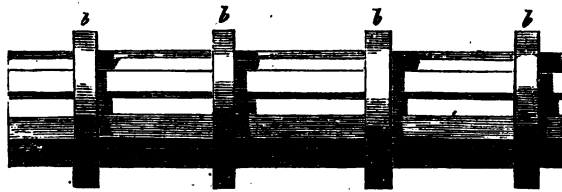
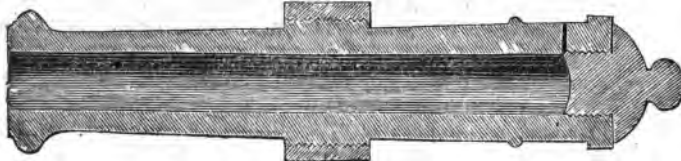


Fig. 4.



feared that the recoil would be excessive. There is also in the Tower a cannon formed of bars of iron hooped together in the same way as a cask, but neither of these cases are exactly to the point.

**ON THE ARRANGEMENT OF WATER PIPES IN
THE STREET.**

THE effect of temperature upon iron pipes, used for the conveyance of water, and also some other circumstances, have been investigated by M. Girard: he has arrived at the following conclusions.

First; according to the effect produced by change of season and temperature upon pipes of this metal placed in subterraneous galleries, they altered in length for each centesimal degree (1.8 degrees of Fah.) 0,0000985, a quantity about one ninth less than it would have been if they had not been confined on their supports by friction.

Second; although this effect is less when the pipes are put in the ground, it is still sufficient to occasion rupture, leakages, and other unpleasant accidents.

Third; if the joints are not made by bolts, but one end of a pipe is inserted into the mouth of the next pipe, then the space for the interposed substance should be as small as possible, and the substance one which swells when in contact with water.

Fourth; The length of the joints should be considerable, both to prevent the escape of water, and the flexure of the system of tubes.

Fifth; to ensure tightness, the stuffing should be confined between a ring fixed to the end of the pipe, and a moveable ring sliding on the tubes.

Sixth; that this precaution may be dispensed with by laying the pipes down in the coldest part of the season.

Seventh; that pipes put into the ground should be supported at intervals, by firm props of masonry, to prevent those inflexions that otherwise occur, and form ruptures.

Eighth; that in large towns, it is advantageous to place these pipes in subterraneous galleries, either such as are made on purpose, or else in the sewers.

Ninth; *that galleries have been tried advantageously for twenty years, and therefore should be resorted to, that these derangements of the pavement, and inundations from broken pipes, which are consequent upon the ordinary mode of proceeding, may, from henceforth be avoided.—Le Globe.*

[We are happy to find that the same opinion of the advantages attending the adoption of sub-ways, for the reception of conduit pipes, is entertained by our French neighbours, as was expressed by us in our account of Mr. Williams's patent, at pp. 329—349, vol. ii. N. S.]

AMERICAN PATENT.**IMPROVED MODE OF FIXING THE MARINERS' COMPASS,**

By **LEMUEL LANGLEY**, of Norfolk, Virginia.—*Dated May, 1828.*

THIS is a very important and valuable invention, just patented in America, by which that indispensable instrument, the mariners' compass, is placed in perfect security against being carried away by cannon shot, or the effect of heavy seas. It is fixed entirely within the planking of the vessel, and is equally visible both upon deck, and in the cabin. Mr. Langley's patent is as follows:—

"The object of my said improvement is to dispense altogether with the binnacle, in which the compass is ordinarily fixed, to cause it to answer all the purposes of a 'tell tale,' and to secure it against accident from cannon shot, the shipping of heavy seas, or other causes of injury. The mode in which these ends are attained, is by cutting a hole through the deck of the vessel, at or near the place where the binnacle is usually situated; this hole is cut through into the cabin, and within it is placed the compass with its box, suspended in the usual way, and when so situated it is completely out of the reach of cannon or other shot. In order to cause it to act as a *tell tale*, the compass box is made with a glass bottom, so that the card can be seen as perfectly in the cabin, as upon deck; I also make the compass card translucent, or semi-transparent, in consequence of which it may always be lighted from below, and will be much more plainly seen at night, than when lighted in an ordinary way. The compass is defended at top by a very thick piece of glass; such as I have used has been three-fourths of an inch in thickness, and this is also defended by a rim, or band projecting above the deck; the lower side of the box is also glazed; and I contemplate sometimes making the sides of the box of glass, should it be desirable to admit light in that way."

LIST OF AMERICAN PATENTS, GRANTED JUNE, 1828.

With Remarks by **DR. THOMAS P. JONES.**

"It is intended hereafter to publish the monthly list of patents granted in the United States, in a form calculated to render it much more useful than the mere catalogue which has heretofore been given. The subjoined list for the month of June, will exhibit the Editor's views upon the subject. In the remarks which will be made, the interest of the patentee, and the rights of the public, will be equally considered. Where we think an invention manifests much ingenuity, or promises to be of great utility, we shall say so; where the subject is one of which we have not the means of forming a judgment, or where a statement of the reasons for our opinion would demand too much space, we shall merely offer an outline of the plan proposed; where we are convinced that the invention is not new, or are of opinion that it is without merit, and will not attain the end proposed,

our convictions, with the reasons on which they are founded, will be made known.

"There are many patents obtained, which, in the opinion of the Editor, ought not to be published until the expiration of the term for which they are granted; and he hopes, at an early day, to see the law so amended as to provide for the sealing up of the kind of patent to which he alludes, and which are technically denominated patents for 'compositions of matter.' Varnishes, compound medicines, compositions for rendering leather, cloth, or other materials, water-proof, and various others, are of this character. He has known persons possessed of valuable recipes, who would gladly have availed themselves of the benefit of a patent, had it offered them any security; but who have refused to obtain one, because in so doing, their processes were liable to immediate publication, and they were of a nature to be practised in secret with absolute impunity. As the Editor will, hereafter, seek to be restrained from making public such patents, it is his determination, in the interim, to impose upon himself that rule of procedure which he thinks ought to be made absolute."

[It will form a very gratifying part of our duty to furnish our readers with regular, successive transcripts of the interesting and valuable information which Dr. Jones has, in the above notice, promised to the American public.

With respect to publishing descriptions of those patents, which relate simply to "compositions of matter," we do not entirely agree with the Doctor, in his view of the subject, however honourable the *motive* which has influenced his express determination. We submit to our readers (among whom we are proud to include the judicious and scientific Editor of the Franklin Journal,) that it is only in those inventions or discoveries, which from their nature must be practised *openly*, that a patent can be of any advantage to the inventor; because those who invade his right, must also practise the art *openly*; the invasion can therefore be easily detected, and indemnification obtained by the injured party. We will now suppose the case mentioned by Dr. Jones, that a person has discovered a new and useful composition of matter, (a recipe) "*which can be practised in secret with impunity.*" This person takes out a patent for it, the specification of which shall be sealed and inviolable for the term of fourteen years; he pays his money for the *protecting* patent, but dare he the more practise his art *openly*? If he does, will not others practise it in *secret* with impunity? but, suppose the inventor has been weak enough to take out a patent for such invention, and is afterwards wise enough to practise it in secret, does he not throw away his money? it would be, in our opinion, more judicious for him to save his money and employ it in practising that art in secrecy, which others can also practise with impunity in secret, if they find it out; and the danger of discovery must be greatly increased by the inventor specifying the exact process, beyond what it would be if he kept the secret to himself, or within the limits of his family, who would have a powerful interest in preserving it. If our reasoning be just, it follows that such a patent is not a benefit, but a positive injury.

The greater part, if not all the patents taken out in this country for compositions of matter *which can from their nature be practised in secret*, are the produce of shameless ignorance or fraud, or both together. Quack medicines and recipes, that are antiquated, pernicious, or useless; "mixtures" that will not mix; "alloys" that will not combine; "universal under-God medicines" destructive to health and life; waterproof compositions, musty from age, and similar things, make up the great bulk of such patents. Then there is another class of quacks, who for the notoriety of a patent, will nominally patent one thing, but specify another; and this is the case we believe with all the really good

empirical discoveries. Dr. James's fever powder, is an instance of this trick ; he was too shrewd a man to specify his discovery, though he had a patent for the sake of the éclat it gave it with the ignorant. The medicine is a peculiar preparation of antimony of great and *deserved* repute ; yet, notwithstanding the publication of the specification, nobody has succeeded in making it, so as to have the same medicinal properties. Dr. James has enriched his family by keeping the secret, and the family still retain it. Were we not extending our observations to too great a length, we would give other instances.

To expose pernicious impositions upon the public credulity, which are from time to time, brought forth under the specious title of *patent*, is, we think, the legitimate business of the editor of a "Journal of Patent Inventions," and as such, we shall perform it to the best of our abilities. But the honest patentee who has been weak enough to patent a valuable process that can "be practised in secret," need be under no apprehension from us, for we hereby bind ourselves to impenetrable secrecy on the matter, till the expiration of the term of his patent. We however believe that our readers will not receive a whit less information from us in such matters ; for to find a patent of the kind, will, we guess, be a more difficult task than that undertaken by Diogenes with his lantern.]

PATENTS GRANTED IN THE MONTH OF JUNE, 1838.

"Improvement in water wheels for mills; Abel Greenleaf, of Mexico, Oswego County, New York, June 5.

"The plan proposed is to employ two or more water wheels, where the undershot kind is used ; the second wheel to be acted upon by the water, after it has left the first ; the two wheels to be geared together, by an intermediate cog wheel, or to be connected by a bann passing over drums upon the wheel shafts, so that, in either case, the motion of the second wheel shall be about one-third less rapid than that of the first ; it being estimated that the water will strike it with a power diminished in that proportion. The fall may be divided into two parts, giving such a descent to each, as shall ensure the action to be nearly in this proportion.

"Improved machinery for striking bricks, called the 'Ohio brick striker;' Ebenezer Duty and Daniel W. Duty, Geauga County, Ohio, June 7.

"This machine is too complex for a short description ; its principal parts are a hopper to contain the compost, a lever to force the same down into a mould under the hopper, and a carriage and lever by which the mould is forced under the striker. The machinery is not clearly explained in the specification, and there is no model deposited to aid us in understanding it. We are told, that the machine was essayed in this city, and not found to answer the expectation of the inventor ; but whether this was from a fault in its principle or in its construction, we are not informed.

"A machine or machinery for making barrels, kegs, &c.; Nathaniel Goodall, and Loren Tainter, Watertown, Jefferson County, New York, June 9.

"The machinery consists of three parts ; the first, for turning the head in a kind of lathe well, adapted for the purpose ; the second, is a trough or box, in which the stave is placed, is forced forward by a follower, and is guided and made to pass between two

knives, one of which forms the rounded, and the other the hollowed side of the stave. The third instrument is a frame in which jointers are made to slide by means of suitable grooves; the staves to be jointed being secured in their proper places by means of an iron frame and cramps. The whole is worked by a shaft set in motion by any sufficient power.

"An improved machine for washing or churning; Daniel Reed, Slaterville, Tompkins County, New York, July 16.

"The patents for washing machines are so numerous, and the family likeness in many of them so striking, that mere description will rarely suffice to distinguish one from another. The present machine has a box with sloping sides and a curved bottom with a dasher similar to that of many of its congeners; the dasher is fixed, and the box made to vibrate upon pins or springs at its upper side. The novelty claimed is the extending the sides of the box upwards, so as nearly to form a triangle, and forming the door on the upper part of the side, instead of on a flat top; by which contrivance it is more effectually closed, and the suds or cream more completely prevented from dashing over, than in other similar machines.

"An improvement in the bedstead, denominated the 'drum sacking bedstead;' Harvey Wilbur, Newburyport, Massachusetts, June 16.

"The mode of tightening the sacking proposed by the patentee, is to have a sliding rail within the head and foot rails of the bedstead; this rail is confined in its place by grooves in the side rails; to the upper edges of these sliding rails the sacking bottom is firmly secured; it is then tightened by screws passing through the head and foot rails, and working in nuts in the sliding rails.

"The Editor has lived upwards of half a century, and he has no doubt that he was born upon a bedstead the sacking-bottom of which was tightened in this way; he cannot, it is true, remember quite so far back, but among his very early recollections are some half dozen bedsteads in his father's house so tightened; some of them appearing as old as the Editor now is. Then why has so excellent a plan been discontinued?—simply because the screw holes, the grooves, and the edge of the sacking-bottom, form so many secure retreats and breeding places for bugs, as to more than counterbalance any supposed or real advantages over the ordinary pins.

"Improvement in the Franklin, or open, stove; William Cowan, Watertown, Jefferson County, New York, June 16.

"A triangular tube of cast-iron, open at both ends, is made to pass lengthwise through the stove, so as to admit of a free circulation of air through it; this air being warmed by the heated iron is intended to economize the fuel. For an ordinary sized stove the dimensions given for the tube, are 20 inches on the front side, 18 on the back, and 10 inches in width on the top. A valve or slide is proposed near the upper part of the tube so as to regulate the draft by opening or closing the throat.

"The cast-iron tube will, we think, be found but little better than the plan of leaving the back of the ordinary Franklin stove exposed

to the air of the room, as is frequently done in setting it. Heated tubes of this kind offer but little advantage, excepting a current of cold air, from without the room, is in some way admitted into them; their heated air will otherwise pass out very slowly indeed, and the radiation from the hot surface of iron, being confined within the tube, will scarcely affect the temperature of the air in the room.

"Improvement in the mode of manufacturing spirituous liquors from the liquid and sediment usually called still slop; David White, Fredonia, Chatauque County, New York, June 17.

"The specification states that the discovery consists in using the liquid sediment, and flour and meal, of grain, and other materials used in distillation, which has been once fermented, and producing a new fermentation, and re-distilling it. The still slop is to be drawn off into clean tubs, cooled down to between 75 and 100° of heat, to have lime, potash, or some other alkali added, to correct, or counteract its acidity; when this is effected and the slop is at a proper temperature, good distillers yeast is to be added, in the ordinary quantity; it is to be allowed to ferment from two to four days, and then distilled. A considerable quantity of spirit will, it is said, be thus obtained.

"Improvement called the 'armed saw frame;' Samuel Sperry, Sparta, Wilson County, Tennessee, June 18.

"This proposes to dispense with the fender posts in which the saw frame usually slides; to attach jointed levers at right angles to the four corners of the saw frame, so as to allow the said frame to work up and down in the ordinary manner. Two of the jointed levers may be attached in front of, and two behind the saw, or the whole four may be placed on one side.

"This is all that is given, and we confess that we should be a little surprised to see a straight kerf produced by a saw so hung, without something equivalent to the fender posts.

"Improvement in the grist mill; Joseph Crail, Warren, Trumbull County, Ohio, June 19.

"In this mill the upper stone is to be stationary, and the lower stone to turn: this is not claimed as a novelty; but it is proposed to use very small stones, say of 18 inches diameter, to give a much more rapid motion than usual, to prevent the heating of the grain by grinding nearer the centre of the stone than has hitherto been done; these, with the manner of preserving a true balance in the under stone, are the improvements gained; it is said that a mill of this kind will do more, and better work, than the ordinary mill, and that with a less expenditure of power.

"An engine or machinery for propelling boats, &c. called 'Talbot's Atmospheric Propelling Engine;' Edward Allen Talbot, late of Dublin, in Ireland, but now residing in the United States, granted in pursuance of a special act of Congress, June 21.

"This will hereafter be described more at large, but as preparations are now making to test the correctness of the principles on

which it is founded, and also the force with which it will act, an analysis would at this time be premature. We will, therefore, merely state that by the aid of two atmospheric cylinders, placed horizontally, with their open ends towards the stern of the boat, the pistons of which cylinders are to be operated upon by means of a steam cylinder or cylinders, it is proposed to obtain a power, acting within the vessel itself, without the aid of paddle wheels, or any substitute therefore, which shall propel a boat with great velocity.

" Machinery for making casks, barrels, tubs, &c.; John Hale, Oakam, Worcester County, Massachusetts, June 21.

" The staves are first formed by being forced, through a machine in which a cutter or shaver, forms the convex side, whilst a wheel provided with a number of cutters, forms the concave side; the axis of this cutter wheel is in a line with the stave, and of course the cutters traverse the grain of the staff to be worked.

" The staves are jointed by passing under another cutter wheel, which, instead of being cylindrical, is hollowed from each edge, so as to be of less diameter in the middle than elsewhere; the staves are passed under this so that they are jointed with the required bulge in the middle.

" The heads are turned in an apparatus very similar to that described in Goodal and Tainter's patent.

" The hoops are shaved or cut, regularly, by a cutter wheel, similar to that first described, there being a regulating guide to govern their thickness.

" Improved mode of fixing the compass on board of vessels; Lemuel Langley, Gosport, Virginia, June 23.

" The specification of this patent we have already given in p. 6.

" A machine or machinery called ' the dormant balance,' for the cure of crooked, or inflected spine, James K. Casey, New York, June 23.

" A gentleman, who is no mean judge in such cases, has pronounced this apparatus ' beautiful and perfect,' and has declared it as his opinion, that ' although the most eminent surgeons have been ' able only to arrest the progress, this machinery must clearly and ' safely effect the cure of crooked spine and its attendant evils.

" We shall, at an early period, give the drawings and description of this apparatus, and therefore need not attempt the latter at present.

" For a method of setting stills, boilers, and kettles, for distilleries, &c.; John Miller and Benton Clemmons, Clemmonsville, Davison County, North Carolina, June 24.

" The plan described is to cause the flues to be so constructed that the flame from one fire may be made to circulate around two, three, or more stills, or boilers; the description and drawings are too imperfect to allow us to judge of the merits of the plan.

" Improved carriers' knife; Isaac H. Harrington, Penn Yan, Yates County, New York, June 25.

" The knife is to be made of the blade of a saw-mill saw, from

which it is to be cut cold; a metal bar, embracing each side, is to be firmly rivetted along the middle of the blade, and to the projecting ends of this the handles are affixed in the usual manner.

"Improvement in the mule for spinning cotton; Thomas Walker, Chester County, Pennsylvania, June 26.

"The fly wheel of the mule is to be made so that it can be thrown out of gear, so that the shaft may turn without being acted upon by the wheel. The shaft has two wheels, the one for bringing the carriage out, the other for taking it in. This is to accommodate it to the purpose of dispensing with the ordinary manual labour, and to cause it both to back off and wind up without this aid. It would, obviously, be in vain to attempt to describe movements which must necessarily be extremely complex; we shall probably publish the whole patent.

"Improvement in the mode of raising ships or vessels, and other bodies from the water, to repair, and exhibit them to view; John H. Green, Providence, Rhode Island, June 26.

"A view of the proposed improvements would demand plates, and descriptions at length; we may, hereafter, take it in hand, but shall wait to hear of the practical operation of the machinery.

"A machine called the 'domestic spinner;' Edward Penny Adams, Jefferson County, New York, June 27.

"This is for spinning wool, in a manner similar to various other machines for domestic use, which have been contrived, to spin several threads at once. The whole machine is described, without a particular specification of what is claimed as new; should we, on comparing it with some others in the patent office, think it possesses any superiority, it shall again be heard of through the medium of the Journal."

IMPROVEMENT IN THE BAROMETER.

AN improvement has been made in the barometer of Gay-Lussac, by M. Bunton, which has received the approbation of the Academy of Sciences at Paris. Its object is to prevent the bubbles of air, which almost inevitably takes place when the barometer is carried either on foot or horseback, or in a carriage, in a horizontal position. It consists in expanding the glass in one part of the wide tube, so as to form it into a chamber, from the centre of which a capillary tube of a certain length descends perpendicularly, by which the mercury must necessarily pass either when rising or falling. If a bubble of air enters, it necessarily moves up by the surface of the large tube, and is stopped at the top of the chamber, producing no error in the observation made whilst it is there. When the barometer is inverted the bubble escapes of itself. This invention, the reporters observe, does away with the only inconvenience attending the use of Gay-Lussac's barometers, without adding any thing to their fragility.

PATENT "METALLIC LINEN."

By RENE FLORENTIN JENAR.—Sealed July 4, 1827.

THE object of this invention appears to be the fabrication of a novel and elegant material, which is to be used in the construction of various utensils, or articles of ornament: it mainly consists in a method of filling up the interstices of wire-gauze, or wire-net, with metal and various other substances.

In filling the interstices of wire gauze with metal in a state of fusion, the latter must be one that is fusible at a much lower temperature than the former, which would otherwise be destroyed. The gauze must also be thoroughly scoured and cleansed preparatory to immersing it in the fluid metal.

To fill iron wire gauze with tin, take a piece of gauze (about a foot square for instance) clean it and tin it in the usual way, then fix it in a frame that will keep it stretched out flat, and immerse it horizontally in a bath of metal, consisting of two parts tin, and one part lead; the operator should at this time be assisted by another person to skim the oxide from the surface of the fluid metal; being gently moved about the bath for two or three minutes, the fluid metal will begin to set or crystallize in the meshes, which when completed in every part, the frame is to be withdrawn carefully edgewise.

To fill wire gauze in moulds with metal. In this case the wire gauze is to be compressed with the fluid metal between an inner and an outer mould: supposing it to be of a hemispherical figure. The outer mould first receives the fluid metal, then the wire gauze (previously formed in the mould of the intended figure) is laid in, and when the interior mould is laid and pressed down, the surplus metal will run out from between them, and the vessel is formed.

To fill wire gauze with metal in the cold state, by pressure only. The filling metal must be in the form of a sheet, and of a softer nature than the wire of the gauze; the pressure must in this case be very considerable, but the operation is quick; and the polish of the metal not being necessarily injured by it, the resulting manufacture has an elegant appearance.

To fill wire gauze with earthenware; the gauze previously formed of the intended figure is to be dipped in the liquefied clay, as often as may be necessary, drying it a little between each dip; when the filling is perfected, it is to be thoroughly dried and baked.

To fill wire gauze with glass, take a sheet or pane of glass, lay it on the gauze, put them together in a furnace; when the glass becomes soft, lay them both on a flattening table, and with a proper instrument press in the glass into an even smooth surface, and the union will be complete: let the plate be then annealed in the annealing furnace.

To fill wire gauze with tortoiseshell and horn. Soften the latter substances by heat while in contact with the gauze, into which they may then be pressed, and be permanently fixed.

MANBY'S PATENT STEAM-GENERATING APPARATUS.

TO THE EDITOR.

SIR,—Among the numerous plans and modifications of steam boilers which have been described in the Register of Arts, there is one in particular, which is in my opinion well worthy of insertion, but which has hitherto remained unnoticed in the work; I allude to the patented apparatus of Mr. Manby, of Tipton, in which the heat is communicated to the water through the medium of oil.

The apparatus consists of a strong cylindrical vessel half filled with oil, which is set in brickwork over a furnace. The oil being raised to a temperature of 300 Faht., is taken out in successive portions by the action of a pump, and forced through a long coiled tube contained in the water vessel or boiler; the water surrounding this long tube (which by its coiling and doubling nearly fills the boiler) abstracts the heat from the oil in its progress, and is thereby converted into steam; the temperature of the oil is in consequence reduced, in which state it runs back into the oil vessel. The continued action of the pump at one end of the oil vessel, and the return of it by a pipe at the opposite extremity, causes a constant current to be kept up throughout.

By this arrangement it was considered that a saving in the quantity of fuel was effected, and that high-pressure steam was raised with great facility, and with perfect safety. How far these statements have been verified by actual experience, I should like to be informed of, through the medium of your Journal, if any of your readers can furnish me with that information.

Your obedient Servant,

Birmingham, Oct. 22nd, 1828.

AN OLD SCHEMER.

MISCELLANEOUS INTELLIGENCE.

CONSTRUCTION OF MAGNETIC NEEDLES.—According to M. de Legey, steel for magnetic needles should not be selected from amongst springs, for such steel is formed of fibres more or less hard, which by the action of the hammer has had different directions and unequal hardness given to them. M. Legey prefers German laminated steel plate, from which he cuts a strip in the direction of the length, and then draws it out so as to close the pores, till it is very brittle. From this plate he cuts the lozenge intended for the needle. All the operations should tend to lengthen the fibres in parallel directions. The steel is then to be hardened, after which it is to be moderately tempered, then polished on the wheel, and finally magnetised.

Before magnetizing the needle it is examined, and usually found to have two poles. Whatever may have caused them, M. Legey regards the needle as more apt to receive magnetism, according to the position of these poles, than in any other direction, and therefore endeavours to preserve them in every operation to which the needle is subjected; thus, in the polishing, it should always be done in the

direction of the length of the needles, and the southern poles should be held opposite to the course of the wheel; a proceeding which it is affirmed preserves the position of the poles. When the needle is magnetized, the same attention to its previous state is to be given.—*Bulletin de la Société d'Encouragement*, 1827.

ASTRONOMY.—Dr. Herschel, having shown that the double stars must be acted upon by a mutual gravitation to each other, and that they can only preserve their relative distances by a periodical revolution round their common centre, conjectures that the *insulated* stars, as our sun and the brightest fixed stars, are removed from the reach of this action. He calculates that the Sun and Sirius (the nearest fixed star,) if the power were removed which retains them in their sphere, would be upwards of thirty-three millions of years in falling together. It is well that the improbability of such an occurrence is so great, as the catastrophe might be rather an awkward one.

CHINESE METHOD OF PLANTING BRANCHES.—The following method is described as being practised by some Chinese retained by Count Linhares, in Brazil. The tree practised upon was a Brazilian myrtle. The branch to be separated and planted, already some inches in thickness, was surrounded by a band of straw mingled with horse-dung, forming an envelope five or six times as large in diameter as the branch itself; then an annular incision was made below this part, and water was allowed to drop for a considerable height on to the wrapped part. The vessel is usually a cocoa-nut shell, pierced with very fine holes. In about two months the branch is separated from the tree, and planted. To obtain rapidly-growing trees, the Chinese choose the upper smaller branches, but for more productive and better trees they choose stronger branches that are nearer to the earth.—*Bull. Univ.*

HYDROCYANIC ACID.—M. Dupuy had given seven drops of this acid to a horse, in order to destroy him. When he was at the point of death, he was rapidly restored by the administration of a dram of carbonate of ammonia.—*Bull. Univ.*

NEW RAZOR STRAPS.—A new kind of razor strap, invented by M. Ferrot, has received the name of *outhe gone*. From the flexibility of leather, a round edge is given to the blade, for which reason paper is used in the new strap. Two kinds of very fine paper have been manufactured purposely, with fine and homogenous pulp, mixed in the one case with fine emery, and in the other with very fine rouge. These papers are then steeped in melted tallow, afterwards pressed to give them a smooth surface, and then cut into bands, and mounted on pieces of wood properly shaped. Each strap has therefore two faces, one gray, on which the razor may be rendered very sharp, and the other red, which, polishing the edge, renders it extremely smooth. The razor must be laid very flat upon these straps—they improve by a few days use. When ineffectual from age, the surface should be rubbed with a very smooth piece of pumice, or with a little pumice powder on marble or ground glass: being then wiped with a piece of cloth, they are brought to their first state.—*Bull. Soc. Encouragement*.

A NEW FIRE SCREEN FOR THE LADIES.—Draw a landscape on paper with common Indian ink, representing a winter scene, or a mere outline; the foliage is to be painted with muriate of cobalt, (green), muriate of copper (yellow), and acetate of cobalt (blue); all which colours dry invisible: but on the screen being held near the fire, the gentle warmth will occasion the trees, flowers, &c. to display themselves in their natural colours, and winter is magically changed to spring. As the paper cools the colours disappear, and the effect may be repeated as often as required.

USE OF CHAMELEON MINERAL FOR MARKING LINEN.—In many large establishments linen requires to be marked quickly, permanently, and economically. The following is a process recommended in France: prepare a chameleon mineral, by heating a mixture of one part of oxide of manganese of commerce, and two parts of nitre, or common potash; to redness; the green substance obtained is to be preserved in dry bottles, as it changes in the air. When required for use, it is to be powdered, and mixed with its weight of pipe clay, and then water added, to make a very thin paste. It is this mixture which is to be applied to the linen, either by a brush, or a stamp, or in the manner of stencilling, or even by a pen, if it be made thin and used quickly. The green paste quickly changes to brown on the linen, and the latter being washed about half an hour afterwards, the loose particles and the potash are removed, and the marks left of a deep brown colour. This writing perfectly resists the action of alkaline lixivia, even though strong; it also resists soap and weak acids: hence the process may be useful to calico-printers. The operation depends upon the reduction of the manganic acid in the chameleon mineral to the state of oxide by any organized matter. The same circumstance renders it necessary to keep the substance from the contact of such bodies, and it is in its best state when recently prepared.—*Quar. Jour.*

LIST OF NEW PATENTS.

SEALING-WAX.—To Peter Rigby Wason, Esq., of the Middle Temple, for an improvement in stick sealing wax. Dated September 25, 1828. Six months for enrolment.

HYDRAULICS.—To James Neville, of Shad Thames, for a machine to obtain mechanical power from streams of water. Dated September 25, 1828. Six months.

RAISING HEATED FLUIDS.—To Thomas Fowler, of Great Torrington, Devon, for raising and circulating water, oil, and other fluids, in a heated state. Dated October 2, 1828. Six months.

COAL GAS.—To John Brunton, of West Bromwich, Staffordshire, for improvements in the apparatus for making coal gas. Dated October 2, 1828. Six months.

LETTER-PRESS PRINTING.—To David Napier, of Warner Street, Fitzroy Square, for improvements in machinery for letter press printing. Dated October 2, 1828. Two months.

STEAM ENGINES, &c.—To Thomas Tippet, of Gwennap, Cornwall, for various improvements in steam and air-engines, and their application. Dated October 9, 1828. Two months.

HEMP, FLAX, &c.—To S. Lawson, and M. Walker, of Leeds, for improved machinery for dressing hemp, flax, and other fibrous substances. Dated October 9, 1828. Six months.

SPLITTING SKINS.—To Henry Duxbury, of Pomeroy Street, Kent Road, Surry, for a new machine for splitting hides and skins. Dated October 9, 1828. Six months.

NAIL MAKING.—To Edward Hancorn, of Skinner Street, London, for certain improvements in making nails. Dated October 16, 1828. Six months.

TO OUR READERS AND CORRESPONDENTS.

The favour of — **WOOLWICH** has been unfortunately mislaid; but it is now before us, and will certainly be inserted in our next.

A private letter for Mr. Fox is left at our Publisher's.



A NEW CIRCULAR PROPORTIONER,

For Facilitating Calculations.—Invented by JOSEPH LAMB, of 86, Newman Street, Oxford Street.

THE extensive application of logarithmic divisions, whether placed on the measuring rods for the use of excisemen, the Gunter's scale for the use of navigators, the scale of equivalents for the use of chemists, or on the sliding rule for the use of engineers, architects, surveyors, millwrights, and indeed of all persons engaged in making calculations, enhances the importance of any plans for rendering such divisions more portable in form, or convenient in application. Mr. Lamb's "Circular Proportioner" possesses both these advantages, but particularly the former; for an instrument much smaller than our engraved representation, and which can be conveniently carried in the waistcoat pocket, contains divisions large and easier read than those usually placed on the 2-foot sliding rule.

On the face of the instrument are engraved one double and two single logarithmic lines in concentric circles. The middle circle, which is the moving piece, and marked A, has both edges divided, for the convenience of acting with the inner and outer circles, which

are marked M and L. The moving and inner circles, A and M, are both numbered 1, 2, 3, 4, 5, 6, 7, 8, and 9. The space betwixt each numbered division is divided into 10, and those divisions read for a second figure. From 1 to 2, each of these 10 divisions is subdivided into 5, standing for the even numbers, in the third place of figures. From 2 to 5, each 10th division is halved for the 5's in the third place of figures. The spaces must be divided by estimation, for the intermediate figures.

The outer circle, marked L, has a double line of numbers: the first half circle numbered 1, 2, 3, 4, 5, 6, 7, 8, 9; and the second half 10, 20, 30, 40, 50, 60, 70, 80, 90. The figures on A and M sometimes signify simply 1, 2, 3, &c., and sometimes 10, 20, 30, 40, 50, &c.—at other times 100, 200, 300, 400, 500, &c.; and as the figured divisions alter, so must the subdivisions: they sometimes stand for decimals, either by themselves, or with one, two, or three cyphers prefixed. In passing unity to the *right*, the numbers will contain a figure more; and to the *left*, they will contain a figure less: the first significant figure in a decimal, will alter in like manner. Two numbers, in a proportion which have the same name, must always be taken on the same circle.

For multiplication, division, and common proportion, A must work with M. For the square root and duplicate proportion, A must work with L: In direct proportion, the first and second terms will stand together; but when the question is indirect, the second and third terms will stand together.

The purposes for which this instrument can be used are so diversified, as to render it impossible to give a general rule for its application; and so numerous, as to render particular rules beyond the space which we can allot for it. The account we have given will, however, render clear its principle and construction: and its application will require no further explanation to those acquainted with the use of logarithmic lines in their various forms, and to others its use will be rendered easy by a small pamphlet which the inventor has published, as an accompaniment to it.

We do not think, however, that Mr. Lamb has acted judiciously in rejecting the arbitrary characters A, B, C, and D, generally used to designate the different lines, and introducing in their stead the characters L, A, M; which are quite as arbitrary, and which render the use of the instrument less familiar to those already acquainted with the rules published in various works on the sliding rule. But as he manufactures them in various ways and of different materials, such as ivory, brass, and silver: sometimes with all the four lines on one side, (as we have represented them) and at other times with two lines on one side and two on the other; we have no doubt he likewise makes them with the usual letters of reference.

SPRING ROLLERS FOR WINDOW SASHES.

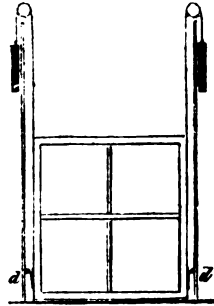
TO THE EDITOR.

SIR,—I think the following little addition to sashes, which I have forwarded, will not be found entirely unworthy your notice.

Fig. 1.



Fig. 2.



Its use is to keep the sash at an equal distance from the sides, so that it may not be impeded in drawing up or down, as is sometimes the case, on account of the sash swinging as it is suspended by the top. This is not the only application in which the invention might be useful, but it having struck my attention as peculiarly adapted to this purpose, I propose it accordingly.

a, fig. 1, is a plate of iron, 2 inches long by 1 inch wide; to the lower part of which is affixed a spring *b*, that carries a roller on its upper end; *c c* are two holes to admit screws to fix it; *d d*, fig. 2, shows its application to a sash. The groove may be cut in the side of the sash sufficiently deep for the whole to be buried when the spring is forced in, as the force of the spring will project the roller sufficiently far enough out to steady the sash.

I must beg your lenity for the roughness of the trifling sketch accompanying this, and shall be happy if this meets your approbation.

Remaining your humble Servant,

30 Sept. 1828.

J. G. WOOLWICH.

ON THE PISTONS OF STEAM ENGINES.

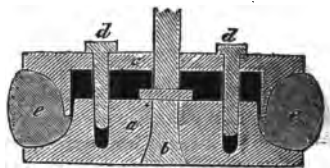
BY THE EDITOR.

THERE is no part of the steam engine in which good principles of construction, combined with the perfection of workmanship, is so essential to the efficiency of its operations as the piston. It is not sufficient that its periphery should accurately fit, so as just to touch every part of the internal circumference of the cylinder, but it must possess the property of expansion; otherwise, the attrition upon its surface quickly reduces its dimensions, leaving a space between it and the cylinder, through which a portion of the steam escapes; whereby the impetus given to the piston is not only reduced in proportion to the quantity of steam thus wasted, but the effect of that portion which does not escape, is partially neutralized by the steam acting on both sides of the piston.

The difference of effect between a good and a bad piston have been frequently found to amount to more than half the power of an

engine, by which it may become incapable of executing the required work, besides wasting half the quantity of fuel consumed; in many other respects the evil from the defects of a bad piston are of serious importance.

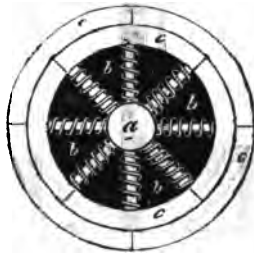
As the piston has hitherto been *usually* made of metallic substances, unalterable by any expansive property therein, they have commonly been *packed* with an external coat of hemp saturated with tallow, in the manner represented by the annexed section.



a is the lower face of the piston, fixed to the piston-rod *b*, by its conical end, and by cotter keys; *c* is the upper face of the piston, fixed to the lower by screws *d d*; *e e* shews the packing of hemp and tallow, filling up the large groove or interstice between the upper and lower discs; this packing presses against the sides of the cylinder, and when it wears away by friction, the screws *d d* are turned, which forces out the packing against the sides of the cylinder; when the packing is entirely worn away, fresh packing is substituted. Pistons nearly of this kind (packed with leather or hemp); were in general use from the time of Papin, and Savery, to that of the Rev. Edward Cartwright, a period of upwards of one hundred years. The last mentioned scientific clergyman, (brother to the late Major Cartwright,) introduced the first expanding metallic piston; an invention of the utmost importance, it being almost indispensable in high pressure engines, as the hemp and tallow packing is quickly destroyed by the great heat of the steam.

Cartwright's metallic piston has been already described in the former pages of this work, with an engraving of it; we will therefore merely state in this place, that it consisted of two concentric rings of brass, of the full size of the cylinder, which were cut into segments, and pressed asunder by feather springs: by this arrangement, open cavities were left between the segments, to prevent the steam escaping beyond which, two other rings of brass cut into similar segments were placed over the others so as to break the joint: that is, the cavities left between the lower segments were closed above by the middle of each of the upper segments.

An improved modification of Mr. Cartwright's piston is represented by the subjoined figure which requires but little explanation after the original one: *a* is the piston-rod, from which radiate a series of spiral springs *b*, that press upon the segments *c c*. In this piston it will be observed the segments are closed, until by the wearing of the cylinder and piston, they open at the joints and diverge by the pressure of the springs, and occupy the enlarged area of the cylinder. The spiral



springs are calculated both by their structure and position, to last longer, and operate with better effect than the feather springs of Mr. Cartwrights, nevertheless, these improved pistons had several defects, which much limited their employment; the following is the most prominent. When the *external segments* wear, and separate by the pressure of the springs, the *internal segments* also separate from the same cause, but they do not wear; consequently, the circular parts of the internal segments no longer fit the external series, but leave open crevices between them, through which the steam first entering the external cavities before mentioned, readily finds its way into the interior of the piston; hence, it proceeds through similar channels, to the opposite side of the piston. These openings likewise admit sand, which lodges and accumulates in the crevices, until they are blocked up, and the springs cease to act.

Notwithstanding the imperfections of Mr. Cartwright's pistons, they were the best then known, and were consequently applied under various modifications to numerous engines. The happy idea of constructing an expanding metallic piston is important in another point of view, as it probably called forth the inventive talents of Mr. J. Barton, who has certainly succeeded in producing a highly improved combination of parts, by which the objections to the Cartwright piston are completely obviated, and the action may be deemed almost perfect. This piston has been described in the former part of this work, but the improved modification now adopted by the inventor renders a fresh description of it a matter of propriety.



Fig. 1.

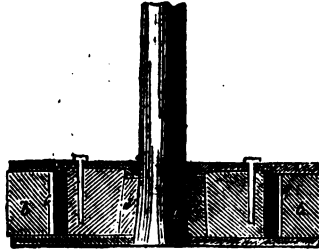


Fig. 2.

Fig. 1 represents a plan of Mr. Barton's piston with the top plate removed; fig. 2, a vertical section of the same, taken in a line with *b, e, d*; in the plan.

a a a a are the four metal segments; *b b b b* four right angled wedges interposed between the segments, their points forming a portion of the periphery of the circle; *c c c c* is a thin steel spring, formed of a single broad hoop, and pressed into the undulated form represented, by which it is found to act with uniform energy upon the wedges, until they and the segments become so much worn in the course of time, that the steel spring recovers itself into its original circular figure; *d* is the frame-work, cast in one piece with the lower plate of the piston; *e* is the piston-rod: the dark spaces shewn on the plan within the circular frame *d*, are cavities to lessen the weight of metal; the other dark spaces are cavities to allow of the free action of the circular spring.

To prevent the segments from falling out of their places whilst the piston is being taken out, or put into the cylinder, the periphery of it is grooved near to its upper and lower edge, in which are sunk two slight spring hoops, cleft across into a forked joint; to lubricate the piston, there is a third groove made between the two former, for the reception of oil; these parts are not introduced into the figures.

The action is as follows:—as the piston and cylinder wear away by the friction, the circular spring *c* presses out the wedges *b*, and these project the segments against the cylinder; by degrees they are reduced to the dimensions of that exhibited in the annexed figure,—

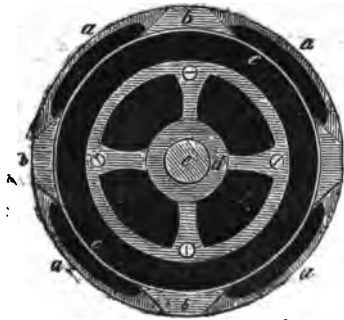


Fig. 3.

which is an exact representation of one we saw taken out of a cylinder, in which it had been constantly working (without repairs), for several years.

Neither the cylinder or piston were in the least degree grooved or scored; but had both retained their circular figure, and were highly polished on their rubbing surfaces; we say this, as the contrary has been stated to Mr. Barton's disadvantage. The Repertory of Arts contained a most uncalled-for statement of this kind from Dr. Gregory, the professor of mathematics at Woolwich; which Mr. Barton answered by having his pistons drawn out from the cylinders of an engine, in Woolwich dock-yard, and shewn to the Doctor.

It is certainly easily demonstrated, that the wedges move faster than the segments, and that consequently the pressure upon the wedges is greater than that on the segments; in a right-angled wedge this difference is as 2 to 1, but the wearing is in no such proportion, nor is there *in practice* any perceptible difference at all; which arises, we conjecture, from the following cause.—The cylinder being of cast-iron and the piston of a much softer and easier abraded metal, (an alloy of copper,) the only effect of the superior pressure of the wedges is to wear them away quicker than the segments, while the wearing of the cylinder, from its superior hardness, is scarcely perceptible. In consequence of this arrangement the brass piston will always conform itself to the circular figure of the cylinder, until worn out.

(To be continued.)

PATENT IMPROVEMENTS IN PROPELLING.

By CHARLES CARPENTER BOMBAS, Esq. of the Inner Temple. — Dated April 29, 1828.

THESE "improvements" may be described in a very few words. They consist in actuating the engines by which the carriage is propelled by atmospheric air, or any gas greatly condensed, in strong vessels resembling Mr. Gordon's portable gas lamps, and arranged about the carriage in any manner that may be convenient. These vessels are to be replaced by others, when they become exhausted, from depositories established for the purpose along the line of road on which the carriage travels. The specification includes a claim for a similar arrangement of gas-holders to be applied in the propulsion of vessels on water in lieu of steam.

It is to be regretted that Mr. Bombas did not consult some person acquainted with mechanical inventions and projects before he took out his patent; for he would then have learned that the scheme had before been often proposed, discussed, and abandoned. Amongst which may be noticed the patented scheme of Medhurst, and also that of Wright.

PATENT IMPROVEMENT IN MAKING ALUM,

By W. STRACHAN, of Avon Eitha, Ruabon, Denbighshire.—*Dated June 12, 1828.*

ALUM, as most of our readers are aware, is a double salt, being composed of the sulphate of alumine, and the sulphate of potash, or ammonia, and is obtained by several different processes. At Selfa-ratara in the kingdom of Naples, it is extracted by lixiviation, from an earth found in those parts, in which the alum exists in a state of great purity. About Newcastle, another method practised to a great extent, is to calcine a species of slate, in which the sulphate of alumine is found combined with iron, lixiviating the mass, and adding to it potash, or a salt of potash. Alum is sometimes formed by the direct combination of alumine, potash, and sulphuric acid.

The improvement which is the subject of the present patent, consists in decomposing the sulphate of iron, (green copperas,) by mixing it with aluminous earth, and submitting the mass to calcination; extracting by repeated lixiviation the sulphate of alumine thus formed, and adding a salt of potash. The patentee has given very full instructions for conducting the process, and has besides described a mode of procuring the copperas, by the decomposition of the sulphuret of iron, commonly called iron pyrites. As some of our readers may be unacquainted with the process, we shall describe it, although the patentee does not claim it under this patent.

"A bed" is first to be formed by building a low wall, about 18 inches high and in the form of a parallelogram; the included area is to be puddled with clay, well rammed down, so as to prevent leakage, then coated with bricks, stone, lead, or any substance which will resist the action of the sulphuric acid; this coating must lie flush with the top of the wall, and be laid with a slope towards one of the long sides; a number of large pebbles are then to be strewed over the surface of the bed, over which the pyrites are to be heaped up; the use of the pebbles being merely to allow of the circulation of air. The heap must be wetted from time to time, and by the combined action of the air and moisture, the sulphuret becomes converted into sulphate of iron, and runs into receivers situated near the bed, wherein they may afterwards be crystallized, or not, at the option of the manufacturer.

Having thus obtained the sulphate of iron, the substances containing the alumine must next be reduced to an even fineness, by crushing, pounding, &c., in order to facilitate the subsequent operations. These substances should be as free from iron, gravel, and other foreign matter as possible, and what is termed grey-shale is mentioned as very well adapted to the purpose. The aluminous substances are then to be calcined in an oven, or furnace, which may be a long arched chamber, having at one end a fire-place, extending its whole breadth, separated from the floor of the furnace by a bridge of leather, and having a chimney at the other end; it has likewise three doors for charging the furnace, and examining the progress of the operation. The charge may consist of about 30 cwt. of the aluminous substance, and when it is well heated, the copperas must

be added in the proportion of 5 cwt. of the crystals or 100 to 900 gallons of liquor, and the whole mass well stirred from time to time; if crystals are used, water must be occasionally added. The heat being now raised, the iron becomes oxidated, and insoluble; and the sulphuric acid combines with the alumine which assumes a pale red tint. The charge is then raked out into shallow cisterns, of which there should be three, each capable of containing one charge, besides as much water as will cover the material. The mass must be stirred from time to time; in about three days' time the whole of the sulphate of alumine will be dissolved; when it is to be run into the large receiving cistern. If it is found not to be 15° heavier than water, it should be poured over fresh materials, and when it attains that strength, it may be passed into the evaporator. A very good form for the evaporator is an arched stone chamber 22 feet long, 7 wide, and 3 feet from the spring of the arch; having a fire-place at one end, extending its whole breadth, and separated from the evaporator or boiler by a bridge. The boiler is to be filled to within two or three inches of the top of this bridge, and the flames being reflected from the arch on to the surface of the liquid, the vapour is carried in a stream with the smoke up the chimney. As soon as the fluid mass attains a specific gravity of 33° above water, the muriate or any other salt of potash used by alum makers, must be added, and the liquor concentrated till its specific gravity is about 38° , when it is to be drawn off into vessels and left to crystallize. No proportions can be given as to the quantity of the salts of potash, as that will of course depend upon the quality of the salt employed. In about ten days the mother water may be drawn off, when the crystals will be found adhering to the sides of the vessels. These crystals must be well washed, and re-dissolved repeatedly, until on being tested with a few drops of any prussic salt, no indications appear of the presence of iron. Being again crystallized, the result is pure alum, fit for all the purposes of commerce; but as alum is usually sold in the state of "roche-alum" it should be re-dissolved in as small a quantity of water as will be necessary with the aid of heat, and then poured into tubs so constructed as to admit of being easily taken to pieces; in these the alum crystallizes in a solid mass; the hoops and staves of the tubs are now separated, and the mass of alum broken into convenient pieces for sale.

AMERICAN PATENTS, GRANTED JULY, 1828.

With remarks by DR. THOMAS P. JOHN.

"Improvement in the machine patented by Amasa Miller, February 18, 1826, for a method of constructing ways for drawing up vessels, and of applying the power in doing the same. Amasa Miller, New London, Connecticut, July 7.

"The advantages claimed by the patentee, are the removal of the ways from under the vessel, after she is hauled up, and the facility of replacing them when the vessel is to be launched, without

lifting her from the position she is in ; the using of a groove in the ways, as a substitute for ribands; there being iron cogs on the bottom of the cradle, which slide in the grooves on the tops of the ways ; the economy with which repairs can be effected, and the small depth of water requisite for using the ways.

" The improvement claimed in the present patent, are, 1st, applying the power to the cradle, instead of swifting the vessel ; and in this way entirely removing all strain, from the vessel to the cradle. 2nd. the using keys instead of braces, to secure the upper poppets. 3rd. having the cradle in two thicknesses, instead of using two sets.

" An improved wind wheel, for grinding grain, and for pumping ; Abner Murray, Athens, Bradford County, Penn., July 8.

" This is a vertical wind-mill, with sails made of wood, tin, or sheet-iron, the wheel about 20 feet in diameter, the sails to be from four to eight in number, and set at an angle of two and a half degrees. The shaft turns an iron wheel of two feet in diameter, and this, two pinions of eight inches diameter, each of which carries a burr stone for grinding, of fourteen inches in diameter. Each pair of stones stand vertically, one of them as a concave, and the other a convex surface. The stationary stone to have a hole in it, one and a half inches from the centre, to let the the grain through.

" When used for pumping, there is to be a crank to give a nine inch stroke to the piston.

" The description of this machine is general, the patentee not informing us whether he claims the whole arrangement, or some particular parts only.

" Improved manner of applying and attaching connecting pipes or tubes, to the boilers of steam engines ; Gideon Freeborn, New York, July 8.

" The specification is as follows : the pipes are attached to the boilers by bolts passing through the boilers to be connected, and lengthwise through the pipes. The bolts have a head on one end, and a nut and screw on the other end, or a nut and screw on each end, by means of which the boilers are brought in close contact with the ends of the pipes, and the whole held firmly together.

" Pipes put in, in this manner, can be cleaned or repaired with less difficulty than in any other."

" Improved machine for dressing and jointing staves ; Levi Benton, Hanover, Chataque County, New York, July 12.

" This machine we shall hereafter describe at large.

" A self-adjusting spring fastening for window-blinds, and shutters, Holly Seely, Unadilla, Otsego County, New York, July 14.

" This is a kind of spring latch, consisting of a strap of steel, about six inches long, let into the under edge of the lower rail of a blind, or shutter, with a catch upon the window sill, and another on

the wall to secure it, whether open or shut. The end of the spring is bent so as to form a thumb piece, projecting inwards to raise the spring, and open the shutter.

"Contrivances for this purpose have become as numerous as sash fastenings, ploughs, and washing machines, and in many of these the differences are so small, as *not to be seen by the naked eye*. If however, they supply the wants of the patentee, and of the public, we shall not undertake the invidious task of interfering with either.

"A machine denominated the rotary washer; Calvin Post, Spring-Port, Cayuga County, New York, July 15.

"There is a cylinder of about six inches in diameter extending across the washing tub or trough. This cylinder is fluted, and is made to revolve by means of a crank; above this, there is a second plain cylinder, having vertical play in its gudgeons; or else a hollow piece suspended as a rubber, and capable of playing vertically. The articles to be washed are allowed to pass between them, they being held and turned about by hand.

"It is proposed to add a fly-wheel to the cylinder, and sometimes to turn it by means of a treadle and pitman.

"This machine has the merit of differing more than usual, both in its form and action, from most of its predecessors, but few of which have been sufficiently long lived to be introduced into society; we shall be happy to hear that this last born of the family is more fortunate. The only washing machine which appears to have received continued approbation, has been the simple flat board with flutes, or rollers, against which the clothes are rubbed.

"A machine called the Longimeter, for the purpose of measuring a ship's way at sea; Abel Bayrd, South Reading, Middlesex County, Massachusetts, July 16.

"The principle upon which this machine operates, is similar to that of Gould's Sea Log, invented about twenty-five years ago, and patented both in this country, and in England; and which was found to keep a ship's way with great accuracy. Gould's log consisted mainly, of a spiral wheel, turning upon its axis by being drawn through the water. It was thrown over the stern of the vessel, and a line passed from it into the cabin; the revolution of the wheel, turned the line, which moved a train of wheels and indexes in the cabin. Many captains used and approved it, and we believe, that it was laid aside, principally, in consequence of the brass spiral wheel being frequently seized, and torn away by sharks. Mr. Bayrd has adopted a similar wheel, but instead of towing it astern, a water-tight trunk is made to pass down through the hold of the vessel and into the water alongside the keel. The spiral wheel, properly fixed to a frame, is made to slide down this trunk, so as to be exposed to the action of the water below the vessel. A rod or pitman, moved by a crank or eccentric wheel, on the shaft of the water wheel, extends upwards, and by means of levers and ratchet wheels, gives motion to indexes intended to shew the vessel's way.

"The dimensions of the water wheel are, four inches length of cylinder; two inches its diameter; six inches length of axle; two inches depth or width of the wings, floats, or buckets: half an inch crank motion of the eccentric drum."

"*A machine for manufacturing paper in the sheet, by the dipping process; Marsden Haddock, New York, he having resided two years in the United States, July 17.*

"There is a horizontal shaft, or cylinder, on which there are fixed stumps or lifters, which give motion to seven levers, and these govern the principal operations of the whole apparatus. The mould and deacle perform their proper evolutions at the vat by means of one of them, and the others in regular succession complete the process. The paper is delivered from the mould on to an endless felt, is immediately carried under the press, which descends upon it, whilst another is deposited ready to undergo the same operation; the pressed sheet is then carried on as the new one takes its place, and is removed by hand to the drying-room.

"In the model, deposited in the patent office, the whole of the motions appear to be well performed, by means which are both ingenious and simple."

(To be continued.)

ARTIFICIAL PRODUCTION OF ULTRAMARINE.

By M. GMELIN, of Tubingen.

A SHORT time since it was announced in the Journals, that M. Guimet had succeeded in manufacturing ultramarine. The announcement has drawn from M. Gmelin a note, in which he describes a method of making ultramarine, and expresses regret that, from an indiscretion of his own, he should have been anticipated. It appears, however, that his regret is without foundation; it is the more so, as every body will be ready to admit that he is the true discoverer of the artificial production of ultramarine, *i. e.* provided it can be made by his process, since he is the first to publish that knowledge to the scientific world in such a manner as truly to constitute a discovery. M. Guimet, like M. Buran with borax, has resigned (as he had a right to do) the honour, which could only be obtained by a partial sacrifice of his interests.

M. Gmelin was led to consider sulphur as the colouring matter of ultramarine, and from an observation by M. Tassaert (*Ann. de Chimie*, lxxxix. 88,) concluded that it might be made artificially. M. Tassaert had remarked the formation of a substance like ultramarine in a furnace used in the manufacture of soda. The following is the method by which ultramarine may be infallibly prepared.

Pulverized quartz is to be fused with four times its weight of carbonate of soda, the mass dissolved in water, and then precipitated by muriatic acid; thus a hydrate of silica will be formed. A hydrate of alumina is to be prepared by precipitating alum by ammonia. These two earths are to be carefully washed with boiling water; the

proportion of dry earth in each is then to be ascertained by heating a small quantity and weighing it. The hydrate of silica used by M. Gmelin contained 56 per cent., and the hydrate of alumina 3.24 per cent.

As much hydrate of silica is then to be dissolved in a hot solution of caustic soda as it will take up, and the quantity determined; then such proportion is to be taken as contains 72 parts of an hydrous silica, and a quantity of the hydrate of alumina, equivalent to 70 parts of dry alumina added to it, and the whole evaporated together, being continually stirred until it becomes a damp powder.

This combination of silica, alumina, and soda, is the basis of ultramarine, and is now to be coloured by a sulphuret of sodium in the following manner. A mixture of two parts of sulphur with one part of an hydrous carbonate of soda is to be put into a Hessian crucible, covered up, and then gradually raised to a red heat until it is well fused; then the mixture is to be thrown in very small quantities at a time, into the midst of the fused mass. As soon as the effervescence occasioned by the water in one portion has ceased, another portion is to be added. Having retained the crucible at a moderate red heat for an hour, it is to be removed from the fire and allowed to cool. It now contains ultramarine, mixed with excess of sulphuret: the latter may be separated by water. If sulphur is in excess, a moderate heat will dissipate it. If all the parts are not equally coloured, a selection should be made, and then the substance reduced to fine powder.—*Ann. de Chimie*, xxxvii. 409.

SCIENTIFIC INSTITUTIONS.

LONDON UNIVERSITY.—This establishment has been opened, at the time announced upwards of six months ago (a singular instance of punctuality in a great public undertaking) under auspices as favourable as the most sanguine expectations of the enlightened promoters of universal education could have desired.

Classes for the various Languages, Mathematics, Natural Philosophy, Chemistry, History, English Law, and for the various departments of Medical Education, are now in full operation, and very numerously attended.

GUY'S HOSPITAL.—A connected and very complete course of Instructions in *Natural Philosophy* has just been commenced at this Hospital, by PROFESSOR MILLINGTON, and ALEXANDER BARRY, Esq. From the outline given in the First Lecture, already delivered, it would appear that their resources for the experimental illustrations of the different branches are very ample, and that the latest discoveries in the various departments of science will be successively introduced.

LONDON MECHANICS' INSTITUTION.—At the conclusion of Mr. PECKSTON'S Second Lecture on *Gas Lighting*, last Wednesday, the Members were informed that Dr. BIRKBECK would commence his course of Lectures on the origin, progress, and improvement, of

Animal Power, on Friday, the 28th of November; and that by that day Tickets would be ready to issue for the admission of new Members for the year or quarter ensuing.

ON A NEW USE OF THE CHROMATE OF POTASH.

By M. KAECHLIN-SCHOUGH.

This use of the chromate is to print a white pattern on a blue or green ground. A blue colour is first given to the cloth by means of the indigo-vat, more or less deep according to the green required; the cloth is then prepared with the aluminous mordant, and passed through hot water; it is then again prepared with an ungummed solution of bi-chromate of potash, consisting of 2½ ounces of salt to 4 pints of water. It is then printed with the following preparation:

Water thickened by roasted starch	4 pounds.
Tartaric Acid	10 ounces.
Oxalic Acid	6 ounces.
Nitric Acid	2 ounces.

The nitric acid is unnecessary, except for delicate designs. The moment this substance is printed, the blue colour is destroyed; the cloth is instantly put into running water, and afterwards dyed in quercitron, or other dye stuffs.

This destruction of vegetable colour arises from the following general fact: whenever chromate of potash is mingled with tartaric or oxalic acid, or with a neutral vegetable substance, and a mineral acid, as the sulphuric or nitric, a strong action takes place, accompanied with the disengagement of heat and gaseous substances. The principal product of this reciprocal action is a new body having acid properties. During the effervescence which takes place the mixture has the power of destroying vegetable colours. Carbonic acid is evolved during the decomposition; and when the mixture is made in a retort, there comes over a colourless liquid, slightly acid, having the odour of weak acetic acid, and reducing the nitrates of silver or mercury if heated with them (formic acid?)

When 9 parts of tartaric acid and 10 parts of chromate of potash are boiled with water, a neutral green liquid is obtained, which being evaporated does not crystallize, but becomes a brittle green mass. When acetate of lead is added to the solution, a precipitate is formed, which being well washed and then carefully decomposed by sulphuric acid, yields a very acid green fluid, uncrystallizable, and with alkalies forming either acid greenish-violet salts, or neutral-green salts. Cold sulphuric or nitric acids do not act upon this substance, but being heated they decompose it. When the acid itself is calcined, it yields green oxide of chrome.—*Ann. de l'Industrie*, i. 121.

MISCELLANEOUS INTELLIGENCE.

FINE RED COLOUR FROM WALNUTS.—A chemist of Brussels, who was recently washing his hands, which were stained with walnuts, in some water which was impregnated with chlorurite of lime, found to his surprise, that the water became beautifully red. He repeated the experiment, and concludes from it that the colour produced by the mixture of the rind of the walnut with the chlorurite may be rendered useful to the arts.

CONDUCTING POWER OF METALS FOR ELECTRICITY.—The following are the results of M. Pouellet's researches on this subject, and are highly interesting, especially as regards the effect of alloys on the metals; for even small quantities of foreign substances exert great influence on the conducting power. The purity of the silver is expressed by the proportion of pure silver per cent. present in the alloy; the column of figures represents the conducting power:—

Silver of 98.6.....	860	Red copper.....	224
Red copper.....	738	Brass.....	194
Silver of 94.8.....	656	Iron.....	121
Fine gold.....	623	Gold of 18 car. fine..	109
Silver of 80.....	569	Platina.....	100

M. Pouellet finds,—1st, That the conducting power is very exactly proportional to the section of the wires, from the smallest diameter, to that of three lines: 2nd, That it is in the inverse ratio, not of the length of the wire, but of the length increased by a constant quantity. This quantity, (2) unchangeable for various lengths of the same wire, changes with the nature of the metal, and for each metal is in the inverse ratio of the section of the wire. M. Pouellet, therefore believes that the conductivity is truly in the inverse ratio of the length of the wires, provided that the resistance opposed to the electricity in traversing the fluid in the cells of the pile, and the different conductors which carry it to the experimental wire could be taken into account.—*Bull. Univ. A.* x. 59.

SEPARATION OF SILVER AND COPPER.—The amalgam obtained at the silver works at Freyberg, leaves, when decomposed by heat, an alloy of silver, copper, and other metals; the latter used to be separated from silver by boiling, and dissolving the whole in strong sulphuric acid, and when precipitating the silver. Of late a process altogether new, has been introduced. The alloy is now heated in a reverberatory furnace, exposed to air, so as to oxidize the copper, and is afterwards put into the cauldrons of lead, and heated with dilute sulphuric acid, which dissolves the oxide of copper previously formed; the operation of roasting and digesting, are repeated once or twice, and many precautions are requisite to obtain a good result, but these being attended to, the process is much more economical than the ancient one. The silver is not so pure, retaining about $\frac{1}{4}$ of

copper; but this is of no consequence for ordinary uses.—*Ann. des Mines*, iii. 15

GEOLOGY.—Some specimens of organic-remains have lately been found in Clashbennie quarry, parish of Errol, on the left bank of the Tay. These specimens have at first sight very much the appearance of shells, but on a closer inspection they resemble more nearly the scales of a fish. What enhances the value of this discovery is, that the rock in which it has been made, is the old red sand-stone, which belongs to that series and geological epoch in which so few organic remains have hitherto been found, and from which we first date the existence of the vertebral animals. The prodigious quantity of this rock, and, of course, of the animals that lie entombed in it, may be estimated from the fact, that the old red-sand stone invariably dips beneath the masses of trap which constitute the hills around us, and forms the basis on which rest the coal and limestone of all the Scottish districts.—*Glasgow Chronicle*.

LIST OF PATENTS

That Expire in the present Month of November.

ORGANS.—To James Longhurst, for an wolian organ, or barrel organ, with a self-acting swell. Dated November 1, 1814.

SHIP-BUILDING.—To John Walters, of Fenchurch Street, for improvements in the construction and fastening of frame timber in ships.—Dated November 1, 1814.

PUMPS.—To William Howard, of Old Brentford, for improved apparatus for working pumps, churns, &c.—Dated November 10, 1814.

ILLUMINATION.—To Leger Didot, of Paddington, for improved means of illuminating houses or places, by the combination of tallow with other inflammable substances.—Dated November 10, 1814.

VERDIGRIS.—To William Benecke, of Deptford, for an improved method of making verdigris.—Dated November 12, 1814.

TIME-KEEPERS.—To Edward Massey, of Coventry, for his chronometers and pocket watches.—Dated November 17, 1814.

SPINNING.—To Horace Hall, of Golden Square, for an improved method of preparing, spinning, &c. fibrous substances.—Dated November 7, 1814.

BLOWING MACHINE.—To Robert Barlow, of Francis Street, Surrey, for an instrument called the *hydrostatic self-blowing machine*.—Dated November 23, 1814.

SADDLES.—To Robert Dickenson, Esq. of Great Queen Street, for improvements in the art of saddlery.—Dated November 28, 1814.

TO OUR READERS AND CORRESPONDENTS.

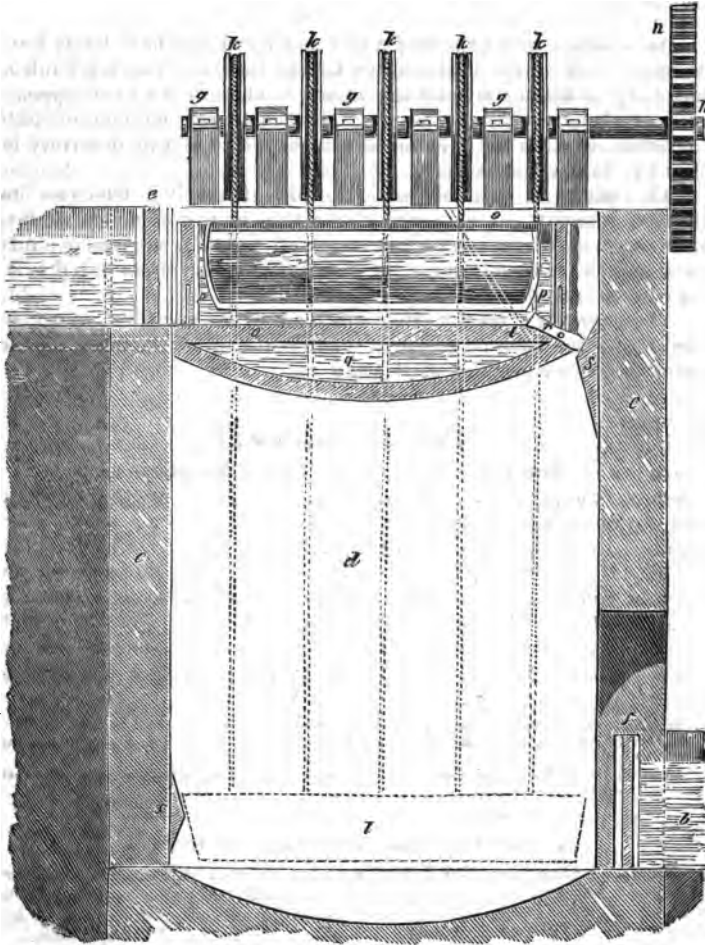
SAXULA's Communication is inadmissible, because, although he may have invented a Locomotive Carriage that will travel with its load upon plain wheels without propelling legs, on a common road rising six inches in three feet, he does not accompany his communication with a description of the apparatus.

Mrs. WILLIAM LEA, of Old Hoxton, has written to us a Letter, stating that he had invented two years ago a machine for the application of atmospheric air to the propulsion of vessels, and liberally offers to show the model to any of our readers who may call at Mr. Ashton's, Good-knives-end, Edgebaston, near Birmingham. To enable all our readers to appreciate its merits, would it not be better for Mr. Lea to send a description to us for publication?

A SUBSCRIBER is informed that we know of nothing to prevent his using in propelling a crank with as many throws as he pleases.

After our correspondents, **Mr. Fox** and **V. I.** (erroneously noticed as **N. I.** in a recent Number) have consulted at our Publisher's some private letters, we will dispose of their Communications.

GEORGE SKINNER's repeated hint will be attended to at the earliest opportunity.



**PATENT MODE OF TRANSFERRING VESSELS
FROM ONE LEVEL TO ANOTHER, WITHOUT LOSS OF WATER.**

By MR. JONATHAN BROWNILL, of Sheffield.—*Dated May 1828.*

THE loss of water in canals by the passing of boats from one level to another, is frequently a source of great inconvenience and expense. Many plans have been devised for preventing this loss of water, some of which have manifested great ingenuity, but from the costliness of the work, the difficulty of maintaining it in order, and sundry other reasons, but few of them have been brought into

VOL. III.—NO. 51.

D

30 NOV. 1828.

successful operation. The most common expedient of the present day are double locks, of a similar construction to those on the Regent's Canal, by which only about half a lock-full of water is lost. In some parts of the Bridgewater Canal, inclined planes are introduced, upon which the boats are drawn up or let down by machinery without the loss of any water. The patented method of Mr. Underhill is of the last mentioned nature, which is fully described at page 81, in our last volume.

The patented plan of Mr. Brownill, which we have now to describe, consists in suspending the boat in a cradle, by chains, whilst a counterpoise is attached to the other end of the chains; and according as the counterpoise is heavier or lighter than the cradle, the boat ascends or descends.

The engraving on the other side represents a vertical section of one side of the apparatus. *a* is the upper level of the canal; *b* the lower level; *cc* section of the end walls of the shaft in which the cradle works; *d* one of the side walls of ditto; *e* the gate of the upper level, *f* ditto of lower level; *g g* a series of bearings supporting the horizontal axle *h*, on which are placed the large sheaves *k k*, on which the suspending chains run; *l* the counterbalance in a side shaft; a similar counterbalance works in another shaft, on the opposite side of the main shaft *d*; these two counterbalances are made to act together by means of the large wheel *n*, acting on a similar wheel on the axle of the opposite counterbalance. This arrangement the inventor terms his *double union lift*: *o* is the cradle having a sluice at each end fitted with smaller sluices *p p*, and having a double bottom *q*; *r* is a short lever at the lower end of the cradle, which does not prevent its ascent, but immediately it arrives above the inclined plane *s*, its upper end cants over, and rests against the dotted lever *t*, termed the release lever, and upon allowing the cradle to descend a little, the lever *r*, acting on the inclined plane *s*, forces the cradle over against the sill of the upper level. At the opposite corner of the cradle is a similar apparatus (not shewn in the drawing) to act upon the inclined plane *x*.

To pass a boat from the lower level to the upper one, the cradle is pressed by the lever which acts on the inclined plane *x*, close over to the entrance of the lower level, and the small sluice *p* being first opened, the larger sluice in the end of the cradle, and the gate *f* are opened. The boat is now hauled into the cradle, and the gate and sluices are then closed. The counterbalances, which are strong iron tanks full of water, are at the top of their shafts, and as much water is let out of the double bottom *q*, as will give a preponderance to the counterbalances when they descend, and of course cause the cradle to ascend, and pass the inclined plane *s*; but as there is a small portion of water in the side shafts, the counterbalances are checked in their descent on reaching this water; they then rise slightly, and allow the cradle to settle on the inclined plane *s*, which forces it against the entrance to the upper level; the small sluice *p* is next opened, and as soon as the water stands at the same level on each side of the large sluice; it is opened as well as the gate of the upper level, when the boat can then pass into the upper level.

If, now, a boat is to be passed from the upper to the lower level, it is hauled into the cradle; the gate *e* and the sluices being shut, as much water is admitted into the double bottom *g*, from a side reservoir (shown dotted) as will give the cradle a preponderance, and the release lever being let go, the lever *r* turns over, and the cradle descends; the boat is then passed into the lower level by the means described for passing it into the upper one. The ends of the cradle must be covered with stuffing of some sort, to prevent as much as possible the escape of water when the sluices are open.

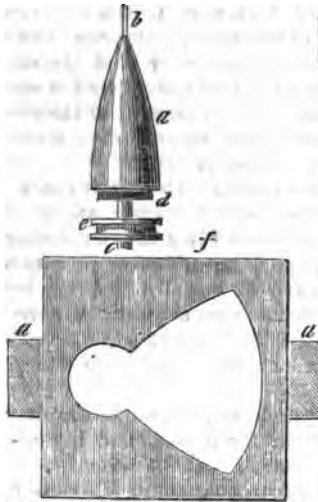
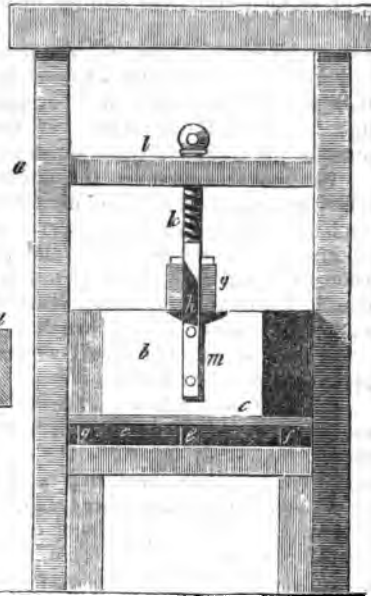
The patentee proposes to employ a similar plan on rail roads, by substituting a perpendicular lift for the inclined planes; and placing the loaded waggons on a platform, suspended in a manner similar to the cradle before mentioned, and raising the platform by counterbalances filled with water from reservoirs, established at the upper level. As we think this plan must strike every one as inferior to the method of inclined planes, we do not think it worth while to go into the details of it, but shall confine our observations to the principle, as applied to canals.

The plan of Mr. Brownill for this purpose is certainly simple, but we fear it would be found expensive in the outset, and difficult of execution. With regard to the expense, it will be seen that three shafts are requisite, requiring more excavating and brick-work than a double lock; the machinery, too, must be of great strength, as the boat cradle and counterbalance cannot be less than 60 tons. Great difficulty, we apprehend, would be experienced in causing the cradle to apply with sufficient closeness to the openings of the levels, to prevent a great loss of water; but if this difficulty can be overcome, the plan might perhaps be found serviceable, especially where the difference of levels is very great. Instead, however, of causing the cradle to ascend or descend, by admitting water into the double bottom, or discharging it from it, which water must of course be lost, we think it would be a better plan, if a hose, similar to the suction hose of a fire engine, were to pass over a roller, one end being in the counter-balance and the other in the cradle, and to this latter end a pump affixed, by which water might be transferred from one vessel to the other; by these means the water would be saved, and the requisite preponderance would be more quickly given to either vessel, as a ton of water transferred from one vessel to another would make a difference of two tons.

PATENT IMPROVED METHOD OF MAKING MOULDS FOR SUGAR LOAVES,

By T. W. & J. POWELL, of Bristol.—*Dated May 17, 1828.*

THE sugar-loaf moulds at present in use are made in the same way as other coarse unglazed red pottery; namely, by the potters' wheel. The patentee proposes to form them upon a mould, then turning them upon the mould by the wheel, and in the process of burning, he proposes to give them a salt glaze both inside and outside. He also proposes to make them of stone ware.

Fig. 1.*Fig. 3.**Fig. 2.*

The machinery employed by the patentee is represented in the figures 1, 2, 3.

a, fig. 1, represents the mould formed of wood or plaster of Paris, or both, and turned perfectly smooth; it has a cylindrical pin *b* in the apex, and in the centre of the base a hole to receive the head of an upright spindle *c*, which projects about an inch through the disc *d*; upon this disc the mould is placed, a small pin from *d* entering a hole in the base to carry it with the disc, when the spindle (which is placed at the potters' table) is set in motion by a band passing round the pulley *e*.

Fig. 2 represents the press in which the clay is prepared for the mould. *a a* the cheek of the press; *b* a stout triangular box secured to the sides of the press, of the shape shown by the dotted lines on fig. 3; *c* a table supported by hinges at one end, and at the other by wedges resting on the frame *a*; a flat board *f* (shown separate in fig. 3) is placed upon the table under *b*; in the box *b* is a thick plank of the shape of the interior of *f*, and across *b* is placed a stout block of wood *g*, which is retained in its place by iron straps *h* bolted to *b*, and having forelocks passing through the top of them; in *g* works the screw *k*, its upper end being steadied by the cross piece *i*, and the lower end pressing upon the thick plank in *b*.

Fig. 3 represents the plank *f*, which is half-an-inch thick, and having a piece taken out of the centre (as shown in the figure); the

dotted lines represent the exterior shape of *b*, the interior being the same as *f*.

The operation is as follows:—the plank *f* being placed on the table and slid under *b*, the table is wedged up; the forelocks are withdrawn from the straps *h*; the block *g* and screw *k* are raised by a rope; the box *b* is then to be filled with clay, and covered with the thick plank before mentioned; *g* is then replaced, and the forelocks driven in: the screw being now turned presses the clay into the mould plank *f*; a wire is then drawn through between the plank *f* and the box *b*; the wedges being knocked out, the plank *f* is withdrawn and replaced by another, and the table again wedged up. The piece of clay in *f* is then to be removed, and placed upon the mould, fig. 1, round which it is wrapped, the edges closed together, and then turned fair and smooth; it is afterwards removed, when sufficiently dry, to the kiln; and when burnt enough the salt glaze is given in the usual manner.

Instead of the box *b* a number of planks like *f* may be placed upon each other, and being firmly clamped together the clay may be pressed into them by the screw, and then being unclamped, a wire may be passed between each, which thus gives a piece of clay ready for the turning mould, fig. 1.

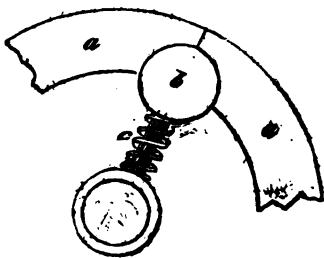
ON THE PISTONS OF STEAM ENGINES.

BY THE EDITOR.

Continued from page 23.

IN France and in America Barton's piston is known only by the name of *Broune's* piston, owing to an American barrister of that name having imported and patented it there as his own invention: it is not only extensively used in those countries, but its benefits have been experienced in almost every part of the world where the steam-engine is employed. Notwithstanding these circumstances, there are few inventions of such great utility that have met with so much senseless opposition. To avoid Barton's patent-right many absurd modifications of his piston have been made; in which it is asserted, in contra-distinction to Barton's, that all tendency to score the cylinders is obviated. We purpose describing some of these modifications, not because they possess the least intrinsic merit, but because they have emanated from men of influence or talent, whose errors ought not to pass uncorrected: but we should premise that description, by observing that Barton's claim to invention consists in the application of wedges to the projection of the segments that compose the periphery of the piston, which wedges, on account of their moving through a greater space than the segments, it is asserted, score the cylinders. How these persons get over this assumed difficulty, the reader will observe.

The first we shall mention is the modification of Messrs. Hall and Son, who are extensive engineers at Dartford. The annexed diagram shows only a part of their piston, the remainder of the circle being, of course, a continuation of the same arrangement.



a a are metal segments of which there are four to complete the circle; *b* a cylinder (of which there are also 4) placed between the segments; these cylinders are operated upon by spiral springs, which project and press asunder the segments, as they wear away by friction against the cylinder. Upon the segments separating they leave gaps or open clefts between them, through which the steam would escape, were it not opposed by another and similar series of segments whose middle parts cover the clefts between the other series, or break joint. The construction of this piston, it is argued, does not invade Barton's claim, for this reason, that cylinders are not wedges. Now, we submit that the geometrical definition of a wedge has nothing to do with the subject, and that, whatever is employed *to wedge* and does *wedge* is a *wedge* in practical mechanics, as well as in common sense. Lord Chief-justice Tenterden, however, decided the reverse, and would not allow a jury to consider the point at all, but non-suited Barton, who had brought an action against Hall for an infringement of his patent-right.

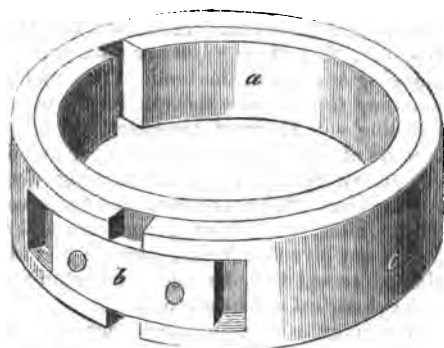
The disadvantage of employing wedges with curved, instead of straight sides, is too evident, upon inspection of the diagram, to need explanation; we shall, therefore, only consider the point as respects the scoring of the cylinders. Admitting the argument to be correct, that the increased friction of certain parts of the circumference beyond that of the others, will have the effect stated; it follows that Messrs. Hall's will make RIDGES in the cylinder; for where the gaps before mentioned occur, the piston is only half as thick as the other parts: consequently, the decreased friction at the gaps will wear the cylinder less by one-half than the other parts, and form projecting ridges.

We shall next describe a piston manufactured by Messrs. Maudslay and Field, known by the name of the expanding ring piston, because this will enable us to rectify two mistakes made by Mr. Tredgold in his excellent treatise on the Steam Engine, and we cannot but regret that so eminent a writer should have exposed himself to such merited animadversion.

Alluding to Mr. Barton's invention, Mr. Tredgold says, (art. 470) "A piston of this kind, and a true cylinder, has been *known to work for some years without requiring any other attention than keeping it properly greased*, yet it is easy to prove that the wedges and segments do not expand equally, hence, in this state it was not applicable to high-pressures." We would here inquire, what signifies this petty

cavilling about what the wedges and segments do, provided they work well without attention for years? And the assertion that the pistons are inapplicable to high-pressures, because of the unequal expansion of the wedges and segments, is universally known to be the very reverse of the fact. We could mention twenty instances where Barton's pistons have been most successfully applied to high pressures for several years' continuance; but we will state only one fact which has in itself the force of a host in disproving Mr. Tredgold's assertion.

In 1823 Mr. Perkins constructed his high-pressure engine, in which he used steam of from 800 to 1000 lbs. upon the inch. The piston in the cylinder was the double expanding ring kind, (as represented in the annexed perspective sketch.)*



It consists of two concentric rings of brass, external diameter 5 inches: *a* is the inner ring, to which is screwed from the inside a bevelled piece of brass *b* that slides and fits flush with the outer ring *c*. The proportions of the parts being accurately drawn, it will be obvious from the great thickness of the rings that they possess but little elasticity, which we have found to be the case on trial. The identical piston now described and lying before us, came out of the cylinder of an engine, manufactured by Maudslay & Co. in which it was afterwards found necessary to substitute Barton's, though the former was not apparently worn: but another piston of precisely the same construction was made by Mr. Field for Mr. Perkins's engine before mentioned. It was found upon trial incapable of standing a day's work, and it scored the cylinder so much as to render it necessary to have it fresh ground. Barton was then applied to, who made a piston for the engine, that acted perfectly (without leakage) under the enormous pressure mentioned for a considerable period, as was

* We have been informed that a piston exactly of this kind was invented by a Mr. Donkin, at Penzance, in Cornwall, in 1818; and that the invention was repeatedly tried in Wheal Vor Mine, for several years, without success. In 1818 Mr. Field introduced the same invention, and has since applied it to several engines constructed by his firm, Maudslay & Co. One of these pistons we have now before us, from which we made the above sketch.

certified by Mr. Perkins at the time. Here, therefore, is a successful application of Barton's piston under a pressure of about 1000 lbs. per inch, notwithstanding which, Mr. Tredgold has stated its inapplicability to high-pressures, which is usually only about 40 lbs. to the inch.

In the next page to that last quoted (229) Mr. Tredgold says "but by combining hardness and elasticity Barton has done much to render these pistons *tight and durable*; they still, however, chiefly depend upon the skill of the workman; *when they are done well by a person who understands them, they undoubtedly answer effectively.*" This observation is about as acute as to say, that "knives are not fit for cutting, but when they are well sharpened by an experienced cutler, they will cut effectively." The inconsistency of Mr. Tredgold on this subject is quite remarkable. He admits that these pistons are "tight and durable", that they "answer effectively" "for years" even without looking at; yet in the teeth of these admissions, which are apparently wrung from him by facts under his own eyes, he adds in the very next line,—"*To avoid the effect which the unequal expansion of the parts of Barton's piston produces, I would recommend the construction shown by fig. 7, where the wedge-formed pieces do not extend to the surface of the cylinder: and to prevent there being an aperture at each joint, two series of segments and wedges should be used.*" We do not give this figure, because it is in every respect the same as Hall's, except that he employs Barton's wedges in lieu of the ridiculous cylindrical substitute of Hall.

We have now to inquire wherein the advantage of Mr. Tredgold's modification consists. It certainly does not lie in the *simplicity*:—Barton has 4 segments, 4 wedges, 1 spring, = 9 parts. Tredgold has 8 segments, 8 wedges, 8 springs, 8 bolts, = 32 parts, or nearly quadruple the number of parts to fit and slide over one another, incurring so much more labour and so much more expense to effect it, and after all, so many more liabilities to derangement. Then, as respects the unjust *insinuation* of Barton's pistons scoring the cylinders, how does Mr. T. proceed to "avoid the effect," he mentions, of the unequal expansion? Evidently, by producing double the friction upon those parts of the piston where the thickness is doubled; and consequently, of wearing the cylinder into 8 *ridges* where the 8 segments divide. Instead of pointing out the blunders of Barton's opponents, the most scientific writer on the steam engine recommends them to the mechanical world as his own invention and improvement!

If Barton's pistons did in reality produce the effects stated, there are some very easy ways of obviating them, without destroying the beautiful simplicity of the inventor's combinations. One of them is to make the wedges as obtuse as possible, by which their motion would be brought nearer to an equality with the projection of the segments: this would be only a partial remedy, but we have another to mention that is more complete. It is to make the wedges (if rectangular) of such a metal or alloy as would be abraded by the cylinder twice as fast, as the metal of which the segments are made. These remedies for the pretended evil may be employed either singly or combined;

but we dare say that they have long since occurred to Mr. Barton, but that he has found it unnecessary to resort to them in practice.

In 1821 Mr. E. B. Symes, of Lincoln's Inn, took out a patent for an expanding hydrostatic piston, the specification of which includes the description of several modifications. Those only which can be considered as at all applicable to steam engines may be described without the aid of explanatory diagrams. In one of them the piston consists of two plates of metal belted together, so as to leave a cavity between them; the plates spread out wider apart at their peripheries, round which is securely fastened to the top and bottom plates a strong hempen band, painted on the inside, and of a texture and flexibility similar to the hose of fire engines. The upper plate has an aperture with a screwed cap, through which the lubricating fluid is introduced so as to fill up the space, when the cap is screwed down to confine it. The two plates being now drawn together by screws, the packing will be bulged out at the sides, and press against the surface of the cylinder, which will be lubricated by the grease oozing through. The pressure of the steam will likewise cause the plates to collapse, and produce a similar effect.

Another modification consists in a cast-iron piston, with a hollow piston-rod, through which the fluid is introduced from a reservoir at the upper end, and communicates with a large groove made round the periphery of the piston, which is inclosed by a covering of canvas as before mentioned, through which the grease finds its way to lubricate the cylinder. We have never met with the application of these pistons to an engine, and we much doubt their capability to sustain even the work of a low-pressure engine, without some additional packing.

In 1822 Mr. Jacob Perkins included in the specification of a patent a description of an expanding metallic piston, which he applied to an engine of his own; it did not, we understand, answer his expectations; (a description of it has been given in this work, vol. iii. p. 170, first series.)

In 1823 Mr. Jessop, of Butterby Hall, near Derby, also took out a patent for an expanding metallic piston, which has some fair claim to notice, as it will, probably, under some new modifications of its principle, be made a very efficient instrument: a description of it has already been given by us, page 184, vol. iii. first series. As we are not acquainted with any other metallic piston, possessing any particular merit, but those we have described, we close the present article.

AMERICAN PATENTS, GRANTED JULY, 1828.

With remarks by DR. THOMAS P. JONES.

" Improved application of power to the common pump; Noah Underwood, Baltimore County, Maryland, July 17.

" THE power proposed to be employed is that of a dog, or other animal; the main object, it is believed, is to raise water for cattle, &c., upon plantations where it is needed. The dog is placed in a

hollow drum, or wheel, like the turn-spit dog of former days; the wheel, of course, must be large to increase the leverage. A crank upon the shaft of the wheel, is connected to the pump handle, by means of a jointed rod, or pitman. It is the application of this jointed rod which the patentee claims, as having first applied it to the purpose stated.

" A machine for thrashing or clearing grain from the straw of rice, or other substances; Asia Nourse, Beaufort, South Carolina, July 19.

" This thrashing machine resembles, in its form, the common grist mill, but, instead of stones, there are two thick framed wooden wheels; these lie horizontally, the lower one, which is seven feet in diameter, being made to turn by a spindle, which passes through a large eye, or opening, in the upper one, which eye is thirty-four inches in diameter. The faces of these wheels are furnished with strips of iron, forming ridges which rise a quarter of an inch above their surfaces. These strips radiate from the centre, but do not coincide, those upon the upper wheel varying three degrees from the centre. The sheaves are put in at the eye of the upper wheel, and the grain is delivered at an opening in the rim. There are some other appendages, as knives for cutting the bands, &c.; but the parts described are the principal.

" Improving and facilitating the means of transport, and conveyance of goods and passengers; John I. Reekers, Baltimore, Maryland, July 21.

" The specification states, that 'this invention or improvement consists in covering the whole surface on which the transport is to be made, with sheets of iron, or other metal, or composition of metals, or ore, of the requisite thickness, by fixing them on the road, or way, in ready-made plates, slabs, or pieces; or by spreading the smelted metals, or ores, over the whole extent of road, or surface intended to be used.'

" Such a road, it is suggested, may become a substitute for railroads, canals, and common roads. How the plates, slabs, or pieces, are to be fixed and secured upon a foundation of sand, clay, and soil, we are not informed; but we must presume, that the patentee has a clear idea of these things in his own mind: we are still more at a loss to perceive how he intends to spread the smelted metals or ores over the whole extent of the road. Should he think proper to favour us with clear views upon these points, we shall be happy to lay them before the readers of our Journal.

" A machine called the 'universal drub,' for thrashing or separating, by rubbing the seed or kernel of all kinds of grain from the straw; Sarnon Felton, Killbuck Township, Holmes County, Ohio, July 22.

" The grain is placed upon an apron, and is carried between a cylinder and a case where the seed is rubbed out. The cylinder is of

metal, punched from the inside, like a grater. The case is perforated with holes through which the seed passes, whilst the straw is carried off, and delivered from another part of the machine. The patentee claims, 1st. The simultaneous revolving and vibrating motion of the roller and case producing the necessary rubbing.

" 2nd. The mode of increasing the vibration when the grain is damp, and *vice versa*.

" 3d. The general arrangement as it contributes to these ends.

" *A machine for manufacturing siding lath and other lumber; Levi Rice, Lockport, Niagara County, New York, July 23.*

" A stock is fixed in a frame, in which it slides freely backward and forward. It is moved by a cog wheel, which works in cogs on one side of the stock, in the manner of a rack and pinion. A knife is fixed upon the stock, and the timber to be cut into laths, &c., is fixed in a frame, and is made to bear against the stock, and the lath is cut by the traversing motion of the stock. The knife, it is said, may have a double edge, so as to cut a lath both by the forward and backward stroke.

" *Cloth for the boots of stages, and other purposes; Peter Laporte, Augusta County, Virginia, July 23.*

" This cloth is composed of hemp and wire, the hemp being twisted lightly round the wire, and the whole then woven in the manner of common cloth. This is to be covered with paint, and it is proposed to use it for boots of stages, for carpeting, sacking-bottoms, pannels, bodies, and tops of carriages, &c.

" *Machine for feeding cotton-gins with seed cotton; Joseph Eubank, Jun., Glasgow, Barren County, Kentucky, July 29.*

" To feed the cotton gin, for the purpose of cleaning the cotton from the seed, there is to be a feed apron, similar to that used in the machine for carding; this apron is carried forward with the requisite velocity, and at the end towards the saws there is a roller or cylinder extending across the whole width of the apron. This cylinder is set with teeth or fangs formed of iron wire, and is made to revolve so as to feed the saws by carrying the seed from the apron against them."

**THE CHEMICAL SCIENCE OF THE LONDON
JOURNAL OF ARTS,
AND THE MODESTY OF ITS EDITORS.**

Nobody can dislike unnecessary controversy more than ourselves; but when we see the editors of a Journal, which is *professedly* scientific, making an attempt to foist upon the public as the genuine offspring of scientific research, a scheme which none but the most ignorant empiric would propose, or even think of, it becomes our duty to expose the imposition; not that we for a moment suppose our subscribers can need such an exposure, but because we know that

a great portion of the public receive the most absurd statements, emanating from such sources, as acknowledged truths.

The subject we allude to is an article by the Editors of the London Journal of Arts, contained in their last number, on the "*filtration of water*," which process, they assert, is perfectly efficacious in rendering the most impure water the most *pure*. Had these gentlemen been content with publishing their own views of the subject without attributing unworthy motives to those who may differ from them, their conduct would have been less reprehensible.

Having told their readers that "*water invariably gives up its solution to the first body with which it may come in contact*," they add, "*we are aware that this theory will be hotly opposed by those who wish to make a job out of the investigation, by putting the public to the expense of canals from distant places*." After reading this passage, the reader will scarcely believe that Messrs. Newton & Partington can wish to make a *job* of this matter themselves; it is, however, true that they strongly recommend "the truly national plan" of filtration, of their friend Mr. Kennedy, as the only efficacious means of supplying the inhabitants of London with pure water, which, although it is to be extracted from the liquid in the great common sewer, called the Thames, is to be infinitely purer than water drawn from distant unadulterated sources.

This extraordinary plan of Mr. Kennedy is stated to be, to allow the liquid of the Thames to percolate through "a bed of *pure* sand of ten feet in depth; but arranged in such a way as to be equivalent to one hundred feet." (The *mystery* of which is, we suppose, that the liquid is made to percolate through beds of sand placed obliquely.) "Into these reservoirs, the water to be purified is to be delivered, and allowed to gravitate through two-thirds of the entire depth of sand, and to *spring* to its *original level* through the remainder."

These scientific editors then proceed more at length into the nature of the plan (but without affording any more information on the subject), and conclude their paper as follows:—

"We have said enough, it is hoped, to attract the public attention to this truly national plan for supplying the metropolis and its satellites with wholesome water; and trust also that we have *proved* that it can be done by the very simple process of filtration, and that too in such perfection as to deprive it of the much-talked-of *animal and vegetable matter*; and, in proof of the exactness of our opinion, we beg to subjoin the testimonials of several of our *first philosophers* in its favour, who, like us, have both tested and tasted with equal satisfaction.

"*Testimonials.* *

BIRKBECK.....	1
THOMPSON	2
MACLINE	3
HEMMING	4
PARTINGTON....	5."

* These pretended testimonials are not given in the journal; our copy is literally the whole given on this point.

We have the pleasure of knowing Dr. Birkbeck and Mr. Hemming, and have the highest respect for their scientific attainments. Messrs. Thompson and Maclane we never heard of before, but they may, nevertheless, be very enlightened philosophers. The fifth named philosopher is one of the editors, and most probably the writer of the article in the London Journal; and we certainly ought not to dispute the claim he has thus set up for himself, as one of "*our first philosophers*," since he has shed upon us such a galaxy of light by the paper alluded to. To be serious, however, we think it really concerns Dr. Birkbeck and Mr. Hemming not to allow their names to be made use of as a passport to the public for one of the grossest pieces of quackery and imposition we ever met with in a public journal. For our own part we feel perfectly assured, without making any inquiry in the matter, that neither Dr. Birkbeck nor Mr. Hemming have ever given any testimonial or opinion that has any accordance with the statements of Messrs. Newton and Partington.

Want of room obliges us to be very concise in our present observations upon this subject, but we shall return to it in our next, when we will give a description of the apparatus.

ON THE PRETENDED ADULTERATIONS OF BREAD WITH FLUOR-SPAR AND GRANITE.

TO THE EDITOR.

SIR,—An extraordinary sensation appears to have been excited by the publication of two letters in the Times of Thursday last, in which it is gravely stated, that the steam engines of Derbyshire are constantly employed in grinding the fluor spar (fluete of lime) so abundant in that country, for the purpose of mixing with, and adulterating wheaten flour; or as one of the ingenious writers says, making "*granite bread*." I have been much perplexed to conjecture the mode by which the dirty, heavy, coloured fluor spar of Derby could be converted into flour, but still more so to discover by what process *granite bread* could be made from fluor flour. I have heard of an Irish apple pie made of quinces, and suppose the process of conversion to be somewhat similar to the Hibernian.

In the present dearth of battles, murders, and Catholic speeches, the Editor of the Times apparently considers those communications quite a God-send. He gloats on the probability of forming stone quarries in our bellies, hugs his misery with rapture, and like the pontic monarch lives upon poisons. He appears so completely gulled, that every hair of his head is bristled upright with horror, and stands on end,

"Like quills upon the fretful porcupine."

Poor Johnny Atkins, the wise London magistrate, was not in greater agony of terror when he communicated to his learned compeers the "*damnable plot*" of the radicals, to enlighten the city by setting it on fire, and to reform the aldermen by cutting their throats while sleeping after a turtle feast. In his lachrymose twaddle contained in a leading article on the occasion, the Editor proposes a somewhat

whimsical scheme to prevent the adulteration of flour in future—it is simply that of grinding, instead of granite or spar, the bones of these “stony hearted villains,” who are engaged in the plan of converting the tender bowels of the people into lime pits, or macadamising the intestinal passages with pounded granite. Whether this fee-faw-fom ogre-like determination of “grinding bones to make his bread,” will improve its quality, I know not; but for my own eating I should prefer the flour flour or granite bread, to that which is formed of dead men’s bones.

One of the sagacious communicators of this horrible intelligence to the terror-struck Editor, informs him that the scientific and delicate test of plunging a hot knife into a loaf, will immediately and infallibly detect the fraud; for if the bread be impure, the knife will be covered with white adhesive matter!—Another scientific analyzer has since informed him that the best test is to heat the suspected flour in a crucible, when if it be adulterated the impure matter will remain in the crucible, but the pure flour will be dissipated into “thin air!!” Prodigious!—Another scientific correspondent informs him that no mode of detection is equal to that of chewing the bread; for if it contain flour or granite it will feel gritty to the teeth!—Unfortunately for any enjoyment of the romantic I am rather incredulous; I doubt the premises, as much as the foregoing worthy conclusions—I hear with as little horror that bread is made of flour spar, as I should feel at being told that plum-pudding was made of mahogany saw-dust; not that I place reliance on the peculiarly delicate tests before mentioned, but because I think that it is as little possible to mistake a mass of baked granite for a quartern loaf, as a mass of boiled saw-dust for a plumb pudding. But as it is probable that some of your readers may be like the Times’ Editor, a little inclined to the marvellous, I beg you to insert in your valuable Register the following tests for the adulterations spoken of.

Place the flour in a tin or leaden vessel, pour over it sulphuric acid, and cover it closely with a piece of glass, apply a gentle heat to the vessel, and if the flour contains any spar, dense fumes (fluoric acid gas) will rise, emitting a suffocating acid odour, and corroding the glass, rendering it permanently opaque.

If the flour or bread contain any calcareous earth whatever, it may be immediately detected by a solution of oxalic acid, water saturated with carbonic acid, or barytic water—Even a solution of any carbonated alkali will detect it if it exist in any notable quantity. To perform this experiment, pour boiling distilled water over the bread or flour: filter the solution through paper, and add either of the liquids mentioned: if lime be present, the transparent solution will become instantly turbid and opaque, resembling milk and water. If a siliceous earth be present a small quantity must be fused by the blowpipe, after a minute portion of potash or soda has been added to it. A globule of glass will be formed if the flour contain any siliceous earth.

I am, Sir, your obedient Servant,

J. H.

**DECISIVE EXPERIMENTS WITH SKEENE'S PATENT
PADDLE WHEELS.**

TO THE EDITOR.

SIR,—Having witnessed an experiment with Lieut. Skeene's patent Paddle Wheels, the result of which I believe has not yet been given to the public, I am induced to send you the following account which I hope will prove acceptable to many of your readers.

The experiment was made on Wednesday, November 19th, on board the Sons of Commerce Gravesend steamer; she was fitted with two of the patent wheels, each of which had 24 paddles ranged in three rows, the paddles measuring 16 inches by 16, and their extremities describing a circle of 9 feet 8 inches in diameter; they appeared to be immersed about 2 feet 6 inches. Before starting from Blackwall, the paddles had been lashed to the arms of the wheels, by which means their action was the same as that of ordinary paddles; this was done in order to shew the comparative effect of the ordinary paddles with the patent ones; and on arriving in Woolwich Reach, the boat with the paddles thus arranged was made to go a distance of six miles by passing backwards and forwards three times between two posts on shore, situate one mile apart: this distance was performed in 1 hour 8 minutes and 30 seconds, the engine doing 40 strokes per minute. The stops on the arms of the paddles being then cut, the same distance was performed by the patent arrangement in 1 hour and 10 minutes, the engine doing 45 strokes per minute; the ebb tide was running during the whole time, and there was a fresh breeze nearly right down the reach, although it was rather less towards the close of the experiment.

The back-water was excessive in both arrangements, and the only difference I could perceive was that the patent paddles threw the backwater right astern, whilst the ordinary arrangement caused the swell to extend rather on the quarter of the vessel. The paddles in turning seemed to strike the arms and the rim of the wheels with great violence, causing an unpleasant noise. The vibration of the vessel was certainly greater with the patent paddles, the paddle box being in a continual tremor; and in all these respects the invention contrasted very disadvantageously with that of Mr. Stevens, part of whose experiments on the City Canal I had the pleasure of witnessing, and was both gratified and surprised at the perfect action of his paddles; they entered the water in the most gentle and quiet manner, and caused no more ripple in leaving it than oars would do, whilst a common paddle wheel which had been fixed to one side of the boat to contrast with the improved paddle, threw the water over the boat's gunwale.

I cannot conclude without bearing testimony to the impartial manner in which Mr. Skeene conducted the experiment, and I should also mention that he said that the patent paddles work best when immersed about one third of the diameter of the wheel; in respect to the power of backing astern in which it has been supposed they

are deficient, we had occasion to back the vessel and I could perceive but little difference in the action.

6, Barret Grove,
Stoke Newington.

Your's, &c. J. MURDOCK,
Mechanical Draftsman.

MISCELLANEOUS INTELLIGENCE.

ON THE FUSION OF TALLOW.—The Council of Health at Nantes has been engaged in an investigation of the best means of fusing tallow, so as to avoid the injury and annoyance which arises from an abundant liberation of vapours, when the ordinary method is used. Much pains has been taken in acquiring all the information possible, and numerous experiments have been made both on a large and small scale. The best process which the Council has instituted, appears to consist in using, according to M. D'Arcet's suggestion, a certain proportion of sulphuric acid, and operating in close vessels. By the use of the acid, the fumes always evolved are very much altered and ameliorated in quality, at the same time that the fused tallow is improved in quality and increased in quantity, the fusion very much quickened, and the use of a press dispensed with. By the use of close vessels, the fumes evolved can be either conducted to a fire-place to be burnt; or, if that may be thought dangerous, in consequence of the occasional boiling over of the melted tallow, can be conducted into a condensing apparatus which is found readily to condense them.

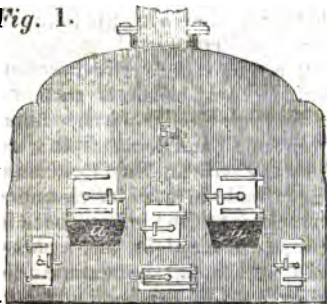
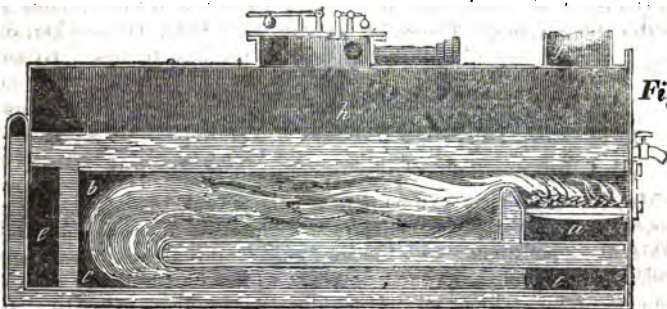
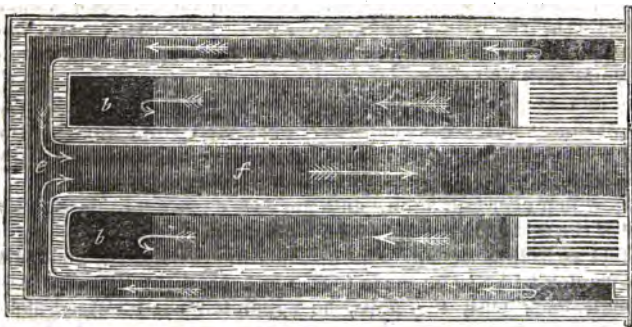
M. D'Arcet uses 100 parts of crude tallow in small pieces, 50 parts of water, and one part of sulphuric acid, sp. gr. 1.848. In some small experiments a digester was used, having a pierced copper plate near the bottom to avoid the necessity of stirring; 1500 (316.5 oz.) parts of crude tallow, 750 of water, and 124 of oil of vitriol, were used, and the fumes conveyed by a pipe into a fire-place; half-an-hour's ebullition completed the fusion. The infusible matter when pressed into a cloth, weighed only 96 parts, and was slightly acid. The tallow was white, hard, and sonorous, and *not* acid. Without the acid the same effect was not produced in an hour.

A tallow manufacturer then tried the experiment with 2 cwt. of tallow, using the acid, but operating in open vessels; 92 per cent. of fused tallow was obtained, and 8 of loss occurred. In a second large experiment with acid, only 5 of loss occurred. The residue does not require the use of a press, but cannot be made into cakes for cattle unless previously freed from acid by washing.

Experiments made on the condensation of the vapour was found to succeed very well, and thus all fear of injury from fire is avoided. The Council propose conducting the vapours into the drains of the works, and so condensing them there; no annoyance being apprehended from the occasional return of the vapours into the building, as that effect can be counteracted by the use of stink traps.—*Ann. de l'Industrie*, i. 295.

TO CORRESPONDENTS.

The Communications of W. R. S.—A MECHANIC,—and I. L.—D, are under consideration.

Fig. 1.*Fig. 2.**Fig. 3.**Fig. 4.*

PATENT STEAM ENGINE BOILER & FURNACE,

By Mr. JAMES FRAZER, of Houndsditch.—*Sealed January, 1827.*

THIS boiler, although applicable generally to the production of steam, is especially designed for the engines of steam boats; with this view no part of the furnace or flue is allowed to come in contact with the wood-work of the vessel, but is wholly surrounded by water; the disposition of the latter in thin layers divided by long intervening flues is ingenious, and well calculated to produce steam with rapidity and economy.

The engravings on the other side represent four different views of the apparatus, the examination of which, together with the following explanation, will render its arrangements evident.

Fig. 1 is a front elevation; Fig. 2 a transverse vertical section; Fig. 3 a longitudinal vertical section; Fig. 4 a horizontal section or plan: the same letters in each figure indicate similar parts. At *a a* are two furnaces and ash pits, the current of air and flames from which first proceed horizontally, (as shown by the arrows) then descending at *b b*, they unite and take a contrary course in a wider channel *c*, immediately underneath the former to the front of the boiler; here the current separates, a part going, as it were, to the right, and a part to the left, into the narrow side flues *d d*, at the furthest extremity of which *e* the currents unite again, and proceed by the middle channel *f* to the front of the boiler, where they ascend into the chimney *g*: *h* is the steam-room. The safety valves, man-hole, steam pipe, &c. being similar to those in other boilers, it is needless to describe them.

PATENT IMPROVEMENTS IN "BEDSTEADS,"

By T. BREIDENBACK, of Birmingham.—Dated August 13, 1828.

MR. BREIDENBACK claims under this patent the application of wire-gauze as a substitute for the sacking, head, tester, and the various hangings of a bedstead; with the view of preventing certain pernicious vermin from establishing their domicile within its precincts, and the intrusion of divers insects and reptiles, whose visits, though short, are sometimes quite as disagreeable. Between the tropics of Cancer and Capricorn, the patentee's bedstead will, for these reasons, be a positive luxury; but we question much whether the sons and daughters of John Bull will, in this temperate climate, altogether fancy the sleeping in a wire cage. The patentee does, nevertheless, design his bedsteads for "home consumption" (as a merchant would say) as well as "foreign trade"; and he is probably right: for although we have no snakes or mosquitoes to torment us, we have those winged *buzzers*, which ever and anon, on a summer's morning, pounce into one ear or the other, turn which way one will, to the utter annihilation of comfort as well as sleep. This consideration settles the point with us, for we don't like to be made to rise just when the flies please:—Mr. Breidenback will, therefore, be appointed our bedstead maker extraordinary. It further strikes us, that these wire-gauze bedsteads will be the finest things imaginable for the security of children, as they cannot tumble out, while they admit a free circulation of air through them all round about.

In lieu of the ordinary curtains, the wire-gauze will be framed into pannels, and connected together by hinges, so as to allow any of them to be opened at pleasure: at the bed-posts the attachments may be either permanent or temporary; the sacking, head and tester, may, however, be permanently fixed; their removal, when required, will properly belong to the business of the mechanic.

PATENT BUOYANT MATTRESSES AND BEDS,By WILLIAM DICKENSON, of Bridge Street, Southwark. — *Dated August, 1827.*

ONE of the principal objections to an extensive adoption in the sea service of an ordinary life-preserver from drowning, arises from its being an *additional* appendage to the "fit-out"; the constant incumbrance of which is probably regarded as a greater evil, than the accidental possibility of its being required; and if required, that it shall be always accessible, and in a state suited for immediate application. To render such contrivances at all times available, a degree of attention is requisite, which is not likely to be bestowed by a sailor, who must appear to his comrades to despise danger whether he does or not. For these reasons we think it a most beneficial application of ingenuity so to contrive the indispensable furniture of a seaman, that it shall be applicable upon any emergency to the saving of life, and we cannot imagine any article so well adapted for this purpose as the light portable hammock bed or mattress. We are, therefore, particularly pleased with Mr. Dickenson's invention, which seems well calculated to effect this object.

The case, or ticking being prepared of the required dimensions, and laid out evenly and flat, a few pounds of horse hair, or wool, &c. are to be evenly distributed over it; over this is to be laid four or five pounds of cork cut into sheets of about an eighth of an inch thick; then another layer of horse-hair as before; the upper sheet of ticking is then to be put on, and the whole is to be connected by repeated stitching through, in the manner of mattress making; and the sides or edges finished in the usual way.

A bed may thus be made to possess sufficient elasticity to sleep upon with comfort; as very little elasticity is destroyed by the interposition of the thin sheets of cork. Upon any emergency, therefore, a sailor may strap his mattress round his body, and bid defiance to the waves for a considerable period of time, without any exertion on his part to preserve buoyancy.

The patentee proposes to make pillows, beds, seats, &c. in a similar manner. With proper attention in the manufacture of these articles, we make no doubt that the patentee will be able to produce some very desirable furniture for the sea service.

AMERICAN PATENT CORN SHELLING MACHINE.By PHILIP GROSJEAN, Louisville, Kentucky. — *July, 1828.*

THIS shelling machine resembles that of Evans, (described by us, with an engraving, vol. ii, N. S., page 220) as is acknowledged in the specification; that is, there is a vertical wheel with ridges or teeth, against which the corn is to be borne by a spring. The patentee proposes to give greater velocity to the wheel than in the former machine; the cog wheel and pinion intended to effect this being to each other as 18, to 4. This wheel and pinion are fixed in a frame, attached to, but distinct from, that of the shelling wheel. The

increased velocity, and the distinct frame, are the improvements claimed.—*Franklin Journal*.

AMERICAN PATENT HAMMERS OF CAST IRON.

By THOMAS JONES, Glastonbury, Hartford, Connecticut.—*July, 1828.*

In preparing to cast the hammers, a piece of iron is moulded with the pattern, against which iron the face of the cast hammer is run, and is consequently chilled and hardened. A small piece is likewise placed in the mould, to come in contact with the claw. The hammers after being cast are to be ground, and polished upon a buff.—*Ibid.*

AMERICAN PATENT LATH-SAWING MACHINE.

By NICHOLAS BRATT, Lockport, New York.—*July, 1828.*

THE title of this specification states it to be an improvement upon Phineas Slayton's machine for sawing hoops, lath, basket stuff, stuff for making riddles, window curtains, and window blinds.

The stuff is to be sawed out by gangs of circular saws, fixed upon spindles, at suitable distances from each other. The manner of gearing adopted by the patentee, it is unnecessary to explain; the principal novelty in it appears to us to be the using of two drums on opposite sides of the shaft or spindle which carries the circular saw; instead of one broad, there are several narrow straps passing over the spindle from each drum; and the friction is said to be lessened, and other advantages gained by this arrangement.—*Ibid.*

FILTERING MACHINES.

IN our last Number, (45) we stated our conviction that neither Dr. Birkbeck nor Mr. Hemming had ever given any testimonials to the effect stated by the Editors of the London Journal of Arts, in their article on the filtration of water commented upon in our last. In this conviction we make no doubt that all those of our readers who know Dr. B. and Mr. H. fully participated; but whatever doubt upon this fact might be entertained by other persons, we shall now be able to remove. The following is a Letter on the subject which we have received from Mr. Hemming.

London Mechanics' Institution,
December 3, 1828.

SIR,—A short time since I analysed some water which had been filtered by Mr. Kennedy in his new filtering apparatus, and found that it contained a neutral salt in solution, although it was perfectly free from mechanical impurity. To the best of my recollection I stated this circumstance in my testimonial to Mr. Kennedy; I distinctly remember informing Mr. K. personally that the salts or substances *chemically* dissolved in water could not be separated by filtration through sand, and never expressed any opinion to justify the conclusions drawn by the writer of the article in the London Journal, on the filtration of water. I have no copy of my Letter to Mr. Kennedy, but I am convinced it contains nothing to support the opinion that water will part with the substances it holds in solution to the first body with which it may come in contact.

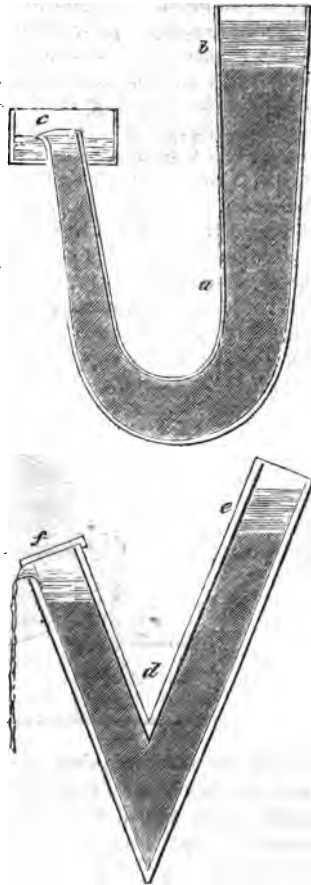
I am, Sir, your most obedient Servant,

JOHN HEMMING.

The information which we received from Dr. Birkbeck on the subject was personal, and in substance the same as contained in Mr. Hemming's letter.

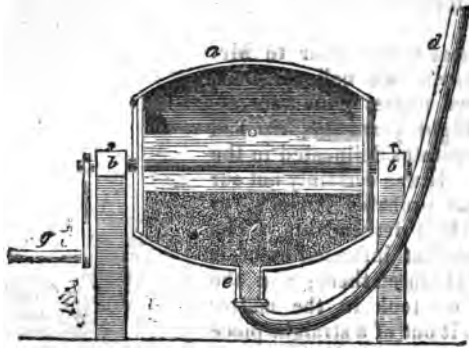
Having now shown that these gentlemen never sanctioned the statement, that filtration was an efficient process for purifying water holding substances in solution, we proceed to a consideration of the mechanical contrivance of Mr. Kennedy, by which, it is asserted, those effects are produced, and of the manner in which "*ten feet of sand is arranged so as to be equivalent to a hundred,*" a paradox which we fear our readers will find as difficult to solve as ourselves. The annexed cut is a sectional representation of Mr. Kennedy's model recently introduced at a lecture by Dr. Birkbeck, at the London Mechanics' Institution, and is the form of apparatus proposed for the use of the Water Companies.—*a* is a metallic tube, gradually tapering from one extremity to the other, and bent into the form represented; this tube is filled with washed sand, excepting a space at each end, the larger end (*b*) of which receives the turbid water, and the smaller (*c*) the water that has filtered through the sand, from whence it discharges itself into a vessel, in order that any fine particles of sand which may have been carried over may subside, and the water be drawn off perfectly clear. Herein consists the whole apparatus of Mr. Kennedy, which is to perform all the wonders set forth by our "first philosopher."

Contrivances very similar to Mr. Kennedy's have, we believe, been made and used almost *from time immemorial*. Eight years ago, we had in use the apparatus delineated in the annexed cut. It was certainly not our invention, but probably Adam's, or one of his earliest descendants. The aged patriarch that informed us of it had it from his forefathers; and the only liberty we took in the matter was, to make it out of a straight piece of common square water-pipe of wood, by cutting it into two, in a slanting direction, then reversing one piece, and joining both together in a secure water-tight manner (unnecessary to explain) into the figure exhibited at *d*, which was filled with sand, except a



space at *t* for the turbid water, and another at *f* for the bright filtered water, which ran off into a vessel placed to receive it. It was employed for filtering rain water, the sand separating from it the various substances that were washed from the roof of the house; we thus obtained water *nearly* pure; it having been previously distilled in the great laboratory of nature, carried on by *Jeholus, Sun, & Co.*

The chief objections to ordinary filtering machines arise from their soon becoming foul, and consequently useless, until restored by cleansing. In filtering *stones* this cannot be easily or effectually performed; *sand* filterers have, therefore, obtained more extensive use, as the cleansing of them is less difficult: but it is still such a tedious, laborious, and stopping affair, that filterers like Adam's and Kennedy's are usually abandoned in a short time as too troublesome. The best way of washing sand is, perhaps, to put it with water into a barrel, suspended on an axis, and turn it about; changing the water until it runs off perfectly clear. Admitting this to be so, it seems to follow that a barrel will make the most convenient filtering machine; we accordingly submit to our readers the following plan for one, which, although the offspring of the moment, we do not perceive any important objection to. *a* is the barrel capable of being turned round, but rendered stationary by pins passing through the extremities of its axis at their bearings *b b*: *c* is a bed of sand occupying about one-third the cask; *d* is the supply pipe or hose (any flexible tube), which conducts the turbid water from a reservoir above into the cask; at *e* is a union joint and nozzle-piece containing a sponge, which serves three purposes; it prevents the grossest impurities of the water from entering amongst the sand, prevents the column of water in the pipe from forcing up the sand, and prevents the sand from falling out of the barrel into the supply pipe. The filtered water is drawn off at *f*



When the sand requires cleansing, the pins at the bearings of the axis are taken out, and the winch turned so as to bring the union joint at the top of the cask, previous to which the pipe may be detached by unscrewing, but this is not necessary. The sponge being now removed, the water may be let on freely at top, and the barrel turned by the winch *g*, by which the sand is expeditiously washed;

the water being let on, and run off, as often as may be necessary, which it is obvious may be effected with so much facility, that the filtering powers may be at any time renewed in a few minutes.

It was our intention to have added a few remarks upon the extraordinary notions promulgated by the soi-disant "first philosopher in the London Journal," "on the nature and properties of water," but it has been so ably done to our hands in the following paper, by an anonymous Contributor, that we shall avail ourselves of his labour instead of our own. We, however, regret to add, that we find it necessary, on account of our contracted space, to omit several very facetious yet argumentative passages, as well as the whole of the introductory observations.

London, Dec. 5, 1828.

SIR,—Before the "first philosopher" commences his description of a filtering machine, he says it is necessary to explain "the nature of water, &c." which he proceeds to do in the following luminous manner. "Water, as is well known, is the universal medium by which the mould (Qy. world) is cleansed from its impurities." He also tells us, that water is "substituted in such a way, that it taints and *sweetens** itself at the same time and with equal facility. A shoal of sea sand absorbs the deleterious particles of a dead whale, and a granite bed the refuse of the forest which caused it."

Never had man more cause to exclaim "save me from my friends" than Mr. Kennedy, the inventor of the filtering machine, which the first philosopher damns so effectually by his mode of praising. In the very introduction to his description, we find him attempting to prove that all filtering machines are superfluous, since he says that water is so *substituted*, that it taints and *sweetens* or sweetens itself at the same time. Whether the bed of the water be a shoal of sand or granite, it can with equal facility swallow up a dead whale, or the refuse of forests.

In order that such important truths should not be thought mysterious or doubtful, our "first philosopher" kindly elucidates the matter as follows:—"To enable us to understand it clearly, the simple beauty of *these* processes, the nature and properties of water should be borne in mind. Water is believed to be composed of minute spherical particles, freely moveable amongst each other, and individually of *exceeding* hardness. Its unconfined surface is perfectly level, and keeps at exactly the same height in vessels communicating with each other; *that* entering into its composition, disperses its particles and converts it into steam, and its specific quantity is bulk for bulk generally lighter than any solid matter."

Our first philosopher appears, however, dissatisfied with his luminous explanation of the sand swallowing dead whales, and granite beds the refuse of forests, but proceeds to "*demonstrate*" "the simple beauty of these processes" thus:—"The sphericity of *this particle* of water, by occasioning interstices between *them*, accounts in a very beautiful manner for that ready absorption of extraneous matter which precedes saturation, and *their* hard impervious nature seems wisely to prevent an inseparable mixture with foreign elements. Physical solubility appears therefore to be nothing more than a mechanical mixture of *little solid atoms*; and the possibility of perfect filtration is hence *demonstrated*!" Speaking of Mr. Kennedy's researches, the "first philosopher" says, "*He* observed that turbid water, in its passage through beds of sand, divested itself of all its *alienal* ingredients, and sprang to the surface of the earth in a state of pristine cleanliness. The inference was therefore obvious, that the sand had *attracted to itself* the vitiatory

* Note by printer's devil.—My master says as how it puts him in a sweat to know the meaning of water sweating itself; but I know the writer means sweetens itself, only he can't spell.

particles, &c." "This remarkable property of water is taken frequent advantage of in our manufactories, but in none with more singular effect than by the dyer, who first saturates a tub of water with colouring matter, and then discharges it by immersing his *fabric*, which attracts to itself the colouring ingredients, and leaves the water in a state of comparative purity. Gin also, in like manner may be drawn from a glass of gin and water, by soaking bread in it. It seems, therefore, that water invariably gives up its solution to the first bodies with which it may come in contact."

It is evident, through the confusion and bad grammar of the first part of the foregoing extract, which render its meaning somewhat dubious, that the "first philosopher" does not know the difference between a chemical solution and a mechanical mixture. Solution he considers to be the admixture of *little* atoms between the particles of water. If this were really the case, water might indeed be speedily deprived of its impurity; but let the first philosopher try the experiment with a saturated solution of arsenic. The "*little* atoms" of the arsenic will be "*attracted*" by the sand, and the solution be delivered after filtration, free from all its "*alienal*" and "*vitiatous*" impurities, if his opinions be correct, and he may drink the cleansed water with impunity. But I will venture to assert, that if he make the experiment with a sufficient quantity, the world will never again be enlightened by such a piece of philosophy, as his article on the filtration of water.

In the last sentence of the quotation—"Water invariably gives up its solution," &c., the "first philosopher" probably means, water gives up the substance it holds in solution; this alteration will make the sentence more intelligible, but its absurdity will remain undiminished, confirmed, as his meaning is, by the gin and water statement.

It is a fact known to every other chemist but the "first philosopher," that there is scarcely a dyeing substance, except indigo, that can be absorbed by a "*fabric*," without the agency of a mordant, or substance which has an affinity for both the cloth and colouring matter. But if the "first philosopher's" theory be correct, that any "*fabric*," dipped into a tub of water contaminated with the most noxious colouring matter, will purify it, why trouble ourselves about filtering machines? It is only necessary to suspend some cloth in our water cisterns, which will "*attract*" the "*alienal particles*" of the water, and restore it to its "*pristine cleanliness*;" and there can be no doubt, that if one blanket were placed near the mouth of the common sewer at Chelsea, and another at the place where the refuse of the gas works is discharged, the source from whence the Water Company derive their supply would be as pure as the rivers of Eden; since, according to the "first philosopher," they must inevitably "*attract to themselves*" every species of impurity: and thus a simple remedy for this great evil is provided, without even a filtering machine. But if we cannot conveniently spare a cloth to "*attract*" the impurities of our water, let us throw in the fragments of the bread basket; for the philosopher says, a slice of bread will "*draw*" even gin from water. Now, this is an entirely new and very important discovery; for if bread can separate alcohol from its solution, the expence and labour of distillation are no longer necessary. Hear this, ye gin spinners; fit up no more private stills, but dip a hunch of bread into your wash; this will "*draw*" away the alcohol; then squeeze it, and repeat the process till all your full proof is "*drawn*" off. Let the Commissioners of Excise search for no more definquents who keep stills, but for those who cut their loaves into suspicious slices. A family has only *once* to provide itself with a few gallons of water, which will serve it *perpetually*, over and over again, to the latest generation, no matter to what uses it be applied, or through what courses it may run! Verily, the combined discoveries of all former philosophers are puny and insignificant, when compared to the single discovery of our present self-styled "first philosopher," that "water invariably gives up its solution to the first bodies with which it may come in contact"!!!

I am, Sir, your obedient servant,

J. H. G.

ON THE SETTING OF STEAM BOILERS.

In the setting of steam boilers, the usual width of the side flues is nine inches; the object of which has been to allow sufficient room for the passage of a sweeping boy to clear them of the soot. In some instances, however, this width has been reduced to four or five inches, and mechanical means resorted to for sweeping them. A double advantage results from this improvement, viz. a considerable saving of fuel is effected, and the degrading employment of the chimney-sweep superseded. The flues will require sweeping more frequently, by their being contracted in their dimensions, but by the removal of a brick or a plug or two, and the insertion of long-handled brushes, it is easily effected.

SCIENTIFIC INSTITUTIONS.

LONDON MECHANICS' INSTITUTION.—On the 2nd of December (being the *fifth* anniversary of this establishment) a meeting of the members and friends of the Institution was held, to witness the presentation of two prizes given by Dr. Fellowes for the best Models or Essays produced by members. Dr. Birkbeck, who presided on the occasion, and who was accompanied by Mr. Denman, Mr. Hume, the Vice-Presidents, and other officers of the Institution, detailed the object of the Meeting, and stated that the first prize had been adjudged, for an *Essay on the Lever*, written by Mr. WARD, who, notwithstanding his regular employment at a very laborious business (that of a machine maker) had contrived in his evenings to write an essay of much originality and merit. As a proof of the originality of the production, the Doctor stated that Mr. Ward had pointed out and corrected several errors in other writings on the same subject; and amongst them were mentioned one in that excellent work on Mechanics, by Dr. OLINTHUS GREGORY, Professor of Mathematics in the Royal Military Academy at Woolwich, which had been copied by Dr. DIONYSIUS LARDNER, Professor of Natural Philosophy and Astronomy in the University of London, into his *Treatise on Mechanics*; in the *Library of Useful Knowledge*, and likewise by Mr. NICHOLSON into the *Operative Mechanic*.*

The President then stated, that the second prize had been awarded to Mr. HOLMES, who, though actively employed in making boots and shoes, had contrived to write an *Essay on the Wheel and Axle*, which did him great credit.

A purse containing 10 sovereigns having been given by the Chairman to each of these members, several votes of thanks were passed, and appropriate speeches made, and the meeting separated.

Through the kindness of Mr. Ward we are enabled to lay his Prize Essay before the public, the merits of which are so conspicuous, as to render unnecessary any apology for its introduction.—

* This is one amongst many instances of the importance of Institutions for the instruction of men in the "principles of the arts they practice."—EDIT.

PRIZE ESSAY ON THE LEVER. THEORETICAL AND PRACTICAL.

By G. G. WARD, Machine Maker.

"Now, in apartments small and damp,
The candidate for 'Fellows' prizes
Sits, pining by the midnight lamp,
Goes late to bed, yet early rises."
BYRON.

INTRODUCTION.

THE elements of machinery are, by writers on mechanics, generally divided into six kinds; viz. the lever, the wheel and axle, the pulley, the inclined plane, the screw, and the wedge.

There seems, however, to be one or two other ways of generating mechanical efficacy, but they are very limited in their spheres of operation.

A little examination will convince us, that the six already named may be resolved into two, namely, the lever and inclined plane, as the wheel and axle, and the pulley, are but modifications of the first, and the screw and wedge are evidently in principle the same as the last.

This enumeration has been objected to by some authors, as calculated to confuse the subject, but as I conceive it to have quite an opposite tendency, I shall pursue this arrangement in the following essay, which will contain a development of the theoretical properties of the lever, with examples of its application in the construction of machines and instruments of various kinds.

In entering upon an explanation of the properties of this important auxiliary to the labours of man, it will neither be unpleasant nor uninteresting to refer to the annals of by-gone days, to ascertain, if possible, to whom we are indebted for the discovery of so useful an agent in our various occupations.

But we shall soon discover, that the books of former times observe a total silence on this subject. Every volume contains the overthrow of some mighty empire; every page is disfigured with the detail of plunder and massacre; but the rise and progress of the useful arts are hidden in mist and obscurity: not even the whisper of oral tradition has told by whom, or when, or where, the mechanic powers were first discovered. The din of battle has drowned the voice of the peaceful arts; and torrents of blood have obliterated the remembrance of the greatest benefactors of mankind.

That their discovery was coeval with the infancy of mankind there can scarcely be a doubt, when we consider how little adapted are the unaided physical powers of man, to carry into effect the vast designs of his stupendous intellect.

The first book of the Pentateuch contains an indirect proof, that the properties of the lever were understood in the time of Abraham; the more especially if the operation of weighing was performed with a steelyard. The passage reads thus: "and Abraham weighed unto Ephron the silver which he had named in the audience of the sons of Heth."

The remains of Hindoo and Egyptian architecture, which strike even the European mechanist of the present day with wonder and astonishment, afford evident proofs of some method of accumulating immense mechanical energy. Among others may be mentioned those vast monuments of ill-directed labour and absurdity, the time-defying pyramids; as the immense masses of stone of which they are composed even to their summits, must have required the aid of machinery of no ordinary construction to raise them to their present elevation.

Another proof that the properties of the lever were early understood, may be deduced from the fact of astronomy having been the favourite science of the early peopled nations of the East; the study of which science would naturally lead to the construction of instruments in imitation of the motions of the heavenly bodies, which could scarcely be effected without a knowledge of the principles on which the lever depends; and we have good proof that astronomy was cultivated by the Persians 3200 years B. C., and in Egypt

and Chaldaea 2800 years B. C. Archytas of Tarentum, who is said to be the inventor of the screw, and who lived 400 years B. C., applied the principle of the lever in the construction of a crane.

But the writings of Aristotle afford direct proof that its properties were understood, as he has endeavoured to explain them, and likewise to reduce some of the other powers to the principle of the lever.

About 254 years B. C. flourished that universal genius, Archimedes the Syracusan, who has erected to himself an imperishable monument by his astonishing applications of the mechanic powers. He is said to have invented numerous machines and engines for raising weights, launching vessels, draining marshes, and various other useful purposes: but our admiration of his genius is unbounded, when we consider the fertility of his inventions, in devising means to defend his native city against the attacks of the Romans. Here, indeed, he shines with redoubled splendour, as the prince of mechanicians, and the able defender of his country against the aggressions of a foreign gigantic power.

Who can for a moment contemplate this venerable character, surrounded by the inventions of his superlative genius, and the numerous applications of his consummate skill in the art of mechanical combination, and not be ready to forgive that slight exaltation of the "conscious pride of art," which modern pseudo-criticism has endeavoured to magnify into a vain-glorious boast. It was but the honest exultation of a soul deeply impressed with the consciousness of mental superiority: it was but that eternal struggle between mind and matter, which led this great philosopher to exclaim, "give me a place whereon to stand, and I will move the earth."

But Archimedes rendered invaluable service to succeeding mechanicians, by his able development of the properties of the lever, which has been a sure guide to those who have made this branch of science their study.

But even these benefits conferred on mankind, were not sufficient to prevent him falling a victim to indiscriminate butchery; and the ruthless sword of a bleeding homicide was buried in the breast of a man, who might otherwise have lived to enjoy the honest reward of his labours, or to have increased his demands on the gratitude of posterity by further inventions or discoveries.

After the time of Archimedes, it is rather difficult to trace the progress of the science of mechanics: those who pursued it seem to have merged into the character of geometers or astronomers: and there appears to have been but very little progress made in the practical part, as the invention of the pump by Ctesibius, and the Clepsydrae by Hero of Alexandria, are the only inventions of note that we meet with.

The fifth century produced several writers on geometry and mechanics, among whom were Theon, Pappus, and Diocles.

Euclid and Proclus wrote in the sixth century on the same subjects.

The flood of Mahomedanism which broke in after this time, seemed calculated to annihilate all traces of ancient science and art; and the destruction of the library of Alexandria by the caliph Omar might have effected this, had not the then living depositaries of learning distributed it in those places where the bigotry and barbarism of their conquerors had driven them.

This calamity was followed by two centuries of gross ignorance and darkness, in which the accumulated labours of 5000 years seem to have been consigned to oblivion; when the Arabians, the authors of the mischief, in part atoned for their crime, by rescuing these very sciences they had before endeavoured to destroy.

They continued to cultivate them from the ninth to the fourteenth century, during which time England gave birth to a genius of no common order, Roger Bacon, who cultivated the science of mechanics with so much success, that it has been said a greater genius had not appeared since the days of Archimedes. The fifteenth century produced several translations of the ancient authors, and science and art gradually gained ground. The seventeenth century was fruitful in writers on mechanics, and several stars of the first magnitude appeared above the horizon at one time: Newton, Leibnitz, and Pascal forming a triumvirate which has never been excelled.

The eighteenth century added a considerable number to the list, which was honoured by the names of Emerson, Euler, the Bernoullis, Ferguson, Smeaton, and Watt.

The nineteenth century has been remarkably fruitful in works on mechanics, but they and their authors are too well known to need enumeration in this place: suffice it to say, that the knowledge of the principles of mechanism seems to be advancing with rapid strides; and the art of printing, combined with the progress of elementary education, has insured them a much wider field of usefulness than it was possible for them to obtain under the manuscript dispensation; and by this means a greater number of active minds will be engaged on this subject, and improvements may be expected rapidly to succeed each other; and there can be no doubt, that under a right direction, these various inventions and improvements may be made subservient to the general comfort and happiness of mankind.

DEFINITIONS.

There are various ways in which we may express our ideas of a lever.

It may be defined an inflexible bar, resting on a fulcrum or prop, which serves it as a centre of motion.

Or, an inflexible right line void of gravity, and having a centre of motion, called the fulcrum.

The following definition will be found to express the nature of the composition of a lever.

An inflexible rod void of gravity, moving about a centre or fulcrum, and having forces applied at two or more points in it.

But, whatever language we adopt in treating of this subject, we of necessity make use of postulata which are not strictly true, but without the aid of which it would be impossible to pursue our investigations of the properties of the mechanic powers. With practical defects or obstacles we have nought to do; we here assume perfect flexibility and perfect inflexibility, non-resistance of atmosphere, bodies without weight, and surfaces moving in contact without friction. Although we know these to be practically untrue, yet we cannot for a moment allow their opposites to enter into our consideration of the theoretical properties of the mechanic powers, whose results are determined by fixed and unalterable laws, eternal as the mind which studies and develops them.

In treating of the lever, three things present themselves to our notice; namely,—a weight to be raised, a fulcrum or support for the lever, and a power capable of raising the weight.

Levers are usually divided into three kinds, called first, second, and third order: but there is a close connection between the three; for a lever of the first order, by reversing the positions of the fulcrum and weight, becomes a lever of the second order; and this again becomes a lever of the third kind, by reversing the positions of the power and weight.

In a lever of the first order, the power and weight act on opposite sides of the fulcrum.

In a lever of the second order the fulcrum is placed at one extremity of the lever, the power at the other, and the weight between them.

In the third kind of lever the fulcrum is at one end, the weight at the other, and the power between them.

Examples.

A lever of the first kind is represented by Fig. 1, where *W* is the weight, *F* the fulcrum, and *P* the power.

Fig. 2 represents a lever of the second order, *W* being the weight to be raised, *F* the fulcrum, and *P* the power to raise the weight *W*.

A lever of the third kind is represented by Fig. 3, where *F* is the fulcrum, *P* the power, and *W* the weight.

It appears scarcely credible, that the greater portion of machinery which is witnessed in daily operation, applied to almost innumerable purposes, and performing such varied functions, should be reducible to such simple elements; but it is nevertheless true, that however varied or complicated their movements, they may be easily shewn to consist of levers or inclined planes, or both united.

Levers of the first kind may be recognised in our every-day occupations, such as applying a poker to the purpose of stirring the coals in the grate, the bar serving as the fulcrum, and the hand acting as the power.

Scissors and snuffers are composed of two levers of the first kind, the rivet being their common fulcrum.

A crow-bar is used indiscriminately either as a lever of the first or second kind.

Balances and steelyards are also of this order of lever.

What are termed bended or angular levers are also levers of this kind; an example of which may be seen in the pole of a carriage, where the pole is the longer arm, the distance between the two front wheels the shorter arm, and the bolt on which they move constitutes the fulcrum.

Those hammers, which have an angular notch at one end for the purpose of drawing nails, act upon this principle.

Common pincers, when used for the same purpose, are levers of this kind, as that part of the board, on which the shorter or circular arm rests when in the act of drawing a nail, serves as the fulcrum.

Levers of the second order are nearly as numerous as those of the first. A pair of bellows offers a familiar instance, the species of hinge at the end nearest the pipe being the fulcrum, the hand the power, and the enclosed air the resistance.

A door is another instance of this kind of lever, when the power

Fig. 1.

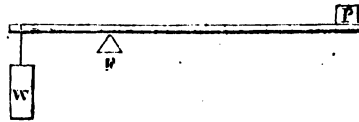


Fig. 2.

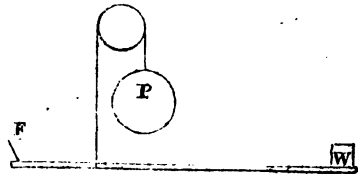
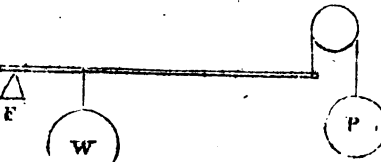


Fig. 3.



which opens it is applied at any point between its centre of gravity and the part where the lock is fixed.

Oars used in rowing boats are levers of this kind, the water serving as the fulcrum, the boat as the resistance, and the muscular energy of the man as the power.

The rudder of a ship is also another instance of this kind of lever, the water being the fulcrum, the vessel the weight to be moved, while the power is applied at the helm.*

Nut crackers and the knives used by last makers are other instances of this kind of lever.

Levers of the third order are not so often met with as those of the first and second; we are not, however, without some familiar instances of their application.

A pair of tongs are composed of two levers of this kind, the joint constituting the common fulcrum, the hand the power, and the matter to be raised the resistance.

Shears for shearing sheep, and those used by weavers, are levers of this kind.

A ladder, when being raised, is a lever of this kind, when the power which is applied to raise it has passed the centre of gravity.

Most of the machinery which is worked by means of wheels and pinions, may be with propriety referred to this kind of lever, when they are used to generate velocity.

As in this kind of lever the resistance moves with greater celerity than the power, it is well adapted to all situations where velocity is of greater importance than the mere object of raising a weight: we therefore find the limbs of animals are formed on this principle; the arm of a man, for instance, where the contractile power of the muscle exerts its force at about one-tenth of the distance between the elbow and the hand, consequently, when a weight is raised by the hand it moves with ten times the velocity of the acting force.

These may serve as examples, by which the ingenious mind will be enabled to trace the principle of the lever, in various other objects which may come within the sphere of its observation. We will now proceed to investigate the properties of this mechanic power by means of a few simple propositions, and endeavour to render them as plain and intelligible as possible.

(To be continued.)

MISCELLANEOUS INTELLIGENCE.

SUBSTITUTE FOR DOMESTIC FUEL.—It is stated in the Literary Gazette, that the following new invention for heating rooms, has met with much encouragement. A pailfull of quick lime, dipped in water, and shut hermetically into a box constructed for the purpose, gives out such a heat as to prevent the necessity of fire during the winter.

* It must be evident to those who have observed the action of a rudder, that there is another kind of force operating besides that of the rudder, as the vessel still continues to move in the direction imparted to it, even after the direct action of the rudder has ceased.

THE EXPECTED COMETS.—The two comets which are soon to appear, excite much interest. According to the calculations of M. Damoiseau, of the French Academy, that comet, whose mean revolution is 2,460 days, will arrive at the perihelion on the 27th of November, 1832, at 32 minutes, 21 seconds after eleven; its perturbation may be 9 days, 15 hours, 56 minutes, 27 seconds.

The comet, the period of which is 3½ years, has a less irregular motion. It re-appeared towards the end of the late summer; on the 11th November it reached its shortest distance from the earth; and towards the middle of the 10th January, 1829, it will arrive at its perihelion. It is hoped that the observation of this comet will tend to resolve the important question as to the resistance of the ether to the movements of celestial bodies.

ENTKE'S COMET.—On the 2nd and 3rd of last month (November) Encke's comet, the original discovery of which we owe to the sister of Sir William Herschel, and the return of which has been recently expected by astronomers with much anxiety, was found by Mr. South, in that part of the heavens exactly which theory had assigned as its place at the time. As this nebulous body is much too small to be visible in any ordinary telescopes, we only notice its return as indicating, in an extensive degree, the perfection to which the science of astronomy is brought.

PAPER LINEN.—A new invention, called *papier linge*, has lately attracted much notice at Paris. It consists of a paper made to resemble damask and other linen so closely, that it is impossible without examination to detect the difference: and even to the touch, the articles made from the *papier linge* are very much like linen. They are used for every purpose to which linen is applicable, with the exception, of course, of those in which strength and durability are required. A French paper, indeed, says that they are almost as solid as those manufactured from linen; but this cannot be possible. The price is very low: a napkin costs only five or six centimes (about a half-penny); and when they are dirty they are taken back at half-price. A good-sized table cloth sells for only a franc (ten-pence); and for the same price one may have a rouleau of paper, with one or two colours, for papering rooms, or for bed-curtains.

TUNNEL IN LANCASHIRE.—That stupendous work of art, the canal tunnel under Standedge, between Manchester and Huddersfield, extends under ground upwards of three miles, and is 220 yards below the surface.

IMMENSE BLOCK OF STONE.—A stone has been lately dug out of Craigleith quarry, 146 feet long, which is 46 feet longer than the shaft of Pompey's Pillar at Alexandria, the wonder of the world for ages; and ten times heavier than the famous block of granite which forms the pedestal of Peter the Great's Statue at St. Petersburg; nay, it must exceed in weight the enormous Boulder stone of Borrowdale, in Cumberland, which has long borne the credit of being the largest detached stone in the world. Here accident seems to have offered

what the utmost skill even of the 19th century would have sought in vain to achieve. An extended continuity of the stratum, of the same exact level, at the place where the operations of the workmen were going forward, and a perpendicular fissure within the bed made it easy to detach this unrivalled extent of stone from the adjacent masses. Being designed for no particular purpose, it must be broken up to supply the ordinary demand from the quarry, unless the citizens of Edinburgh snatch this opportunity of adorning their city with a column, such as no capital in ancient or modern times has yet been able to boast of.

POISONING OF VEGETABLES BY VEGETABLE POISONS.—M Marcet's experiments on vegetable poisons are worthy of notice. Having ascertained that bean plants could exist in a healthy state for five or six days if immersed in spring water, he tried them with five or six grains of opium dissolved in an ounce of water; the consequence of which was, that in the evening the leaves had dropped, and by the middle of the next day they were dead beyond recovery. Hemlock was equally fatal; and six grains of dry powdered fox-glove (*digitalis purpurea*) in an ounce of water, began to operate by wrinkling some of the leaves of the bean in a few seconds, which it completely killed in 24 hours. Oxalic acid, though found in sorrel, (*rumex acetosa* and *oxalis acetocella*) as well as in several other plants, proved very fatal poison to others. The absorption of one-tenth of a grain killed a rose branch and flower in 48 hours.

INTENSE LIGHT.—It is stated by an eminent German chemist, that hydrate of lime, pulverized, and exposed upon charcoal to a stream of oxygen, through a blow-pipe, with an orifice of 0.02 of an inch in diameter, fed by a common lamp, gives the most intense light. He attributes this to a sort of pulverulent atmosphere, which the lime disengages at that temperature. Substances that do not form molecules in a gaseous state, cannot produce so vivid an incandescence.

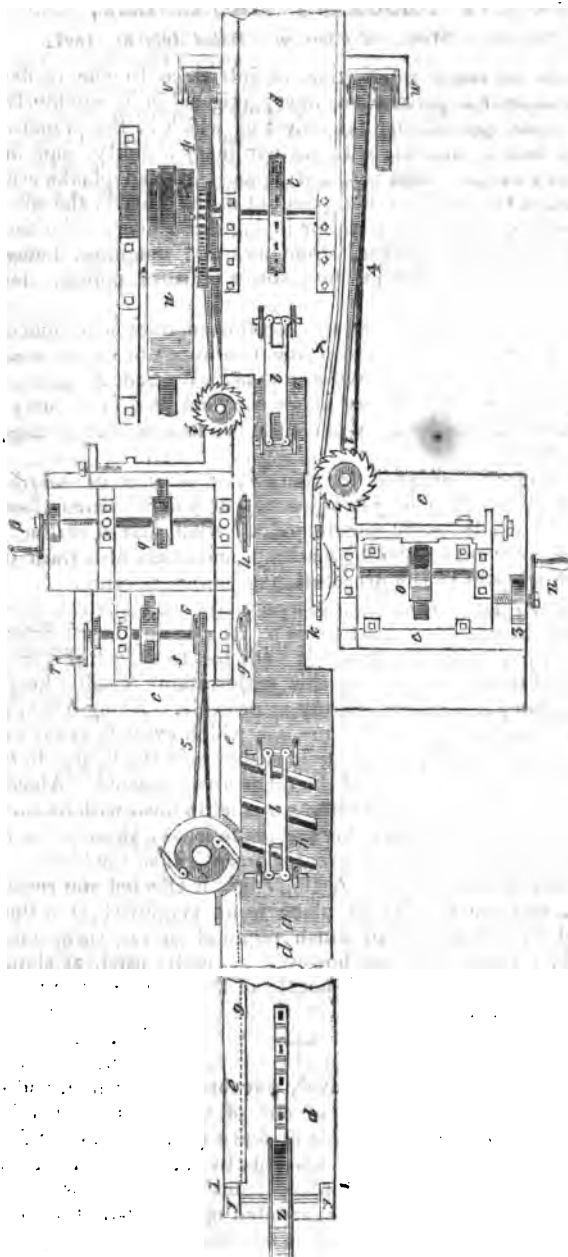
TO OUR READERS AND CORRESPONDENTS.

The valuable **TREATISE ON THE LEVER**, which we have commenced in our present Number, will be completed in the fourth or fifth succeeding one. It will be afterwards published (on the 1st of February) in a separate form; but as no more impressions will be taken than are subscribed for, those persons who may wish for copies should send their names and address to our Publisher's. The matter will be comprised in 40 or 50 pages, including 42 engravings, illustrating the best practical applications of the subject to various machines;—price One Shilling.

GRANITE BREAD.—We have received from Mr. G. Whipple a reply to J. H.'s paper on this subject contained in our last, which press of matter obliges us now to omit; but the substance, if not the whole of his communication, will be inserted in our next.

The article on **Lightning-Conductors** is probably sent to us by mistake; it remains at our Publisher's for the Writer.

If H. H. consults Galloway's **History of the Steam Engine**, he will see several rotary engines closely approximating to his invention.



MUIR'S PATENT MACHINERY FOR PREPARING FLOORING BOARDS.

PATENT FLOORING MACHINERY,By MALCOLM MUIR, of Glasgow.—*Dated July 31, 1827.*

It affords us much satisfaction to introduce to our readers a description of some important machinery, original in its combinations, and novel in its application; the object of which is the preparation of complete flooring boards, with extraordinary rapidity, and in the most perfect manner. The rough irregularly-shaped planks are put into one end of the machine, and pass out at the other in the space of a few seconds, in a finished state for laying down floors; the several operations of sawing, planing, grooving, and tonguing, being all carried on at the same instant, by a series of saws, planes, and revolving chisels.

The drawings attached to the specification embrace two isometrical projections of the machine (taken from two opposite views) and one plan, affording a very clear idea of every part. We find, however, that by making some slight modifications of the plan, that figure only (together with our explanation) will enable the reader fully to comprehend the subject.

The machinery is adapted for the *simple planing* of boards; as well as the preparation of *plain-jointed*, or *square-jointed flooring*. To render the whole easily understood we shall first describe those parts which constitute a planing machine, and afterwards those other parts which adapt it to the preparation of jointed flooring.

The *planing-machine* consists of a perfectly flat and straight bench *d d d*, which should be at least twice as long as any board intended to be prepared upon it. This bench is made fast to a block of stone *c c*, or other solid matter, which together with suitable framing keep the whole machinery as firm and steady as possible. Along one side of this bench is a raised guide or fence *e e*, which extends as far as the circular saws *i*, but only a part of it is shown in the figure, in order to bring more into view some of the other arrangements. About the middle of the bench a metallic plate *a a* is let in flush with its surface, which forms a durable stock for the plane irons; these plane irons are of the usual form, but of greater breadth than the boards to be planed; the projection of their cutting edges is effected and regulated by screws, and the number of plane irons employed at a time is determined by the degree of finish required to the surface of the boards; three plane irons are, however, generally used, as shown at *h h h*, the dark spaces being the mouths of the planes; from which it will appear that it is the lower side of the board that is planed, and that the shavings are delivered under the machine. An endless pitched chain, having catch-hooks at convenient distances, take hold of the boards as they are successively put into the machine, and drag them along the bench; the edge of one of the sides of each board passing under a rebate in the guide or fence (as shown in the figure) prevents the board from bending upwards by the action of the chain, while it is pressed down to the plane irons by springs or weighted levers, as seen at *b b*, which are mounted upon anti-friction rollers, the axles of which are so inclined as to cause the boards to be uni-

formly driven against the fence, and to pass in a straight line through the machine. Motion is given by a band from a large revolving drum placed above the machine (not shown in the figure) which communicates with the drum *u*; upon the shaft of which is a pinion which drives the toothed wheel *j*; the axis of the latter carries the pitched rigger *t*, round which the endless chain is passed and stretched in a parallel direction with the bench, by passing over the pulley *x* at the opposite end of the machine: at which place only a small piece of the chain is brought into view, as the introduction of the whole of it would hide or tend to confuse some of the other parts of the apparatus. The pulley *x* is mounted upon a tightening frame *y*, which moves upon a joint at the lower end, the tension being increased or lessened by means of the wedges *l l*, or by regulating screws. The parts we have thus described constitute a separate machine for the *planing* only of boards.

For the preparation of plain or square-jointed flooring boards, the following additional apparatus is brought into operation.

A part of the fence *e* is slightly hollowed from the direct line of the bench, to admit of projecting inequalities on the edges of the boards, which are removed by irons or cutters fixed on a horizontal revolving plate *f*, the periphery of which enters an aperture in the fence *e*; and it is on the edge of the board presented to this side of the machine that a tongue or feather is formed when required. To produce this effect, two circular saws *g* and *h* are used, one of which (*g*) revolves under the board, and cuts it upward, the other (*h*) revolves above the board, and cuts it downward, to such a depth only on each side, as to leave a tongue or feather of the required thickness uncut. By the progressive motion of the board it next passes under the operation of two circular saws *i*, only one of which can be seen, as the other is directly underneath on the same spindle, and separated only by a ring or washer, which is of the same thickness as the tongue. These saws acting horizontally, or at right angles to those of *g* and *h*, cut off the superfluous wood, and leave the tongue projecting from the board and completely formed.

The opposite edge of the board is cut parallel to the other, by a circular saw *k* revolving vertically, which is called the "breadthing saw;" a guide fixed to the head *o*, which supports the spindle of this saw, (but which cannot be seen in the figure,) is so placed as to conduct the superfluous pieces separated from the boards by the saw *k*, underneath the circular saw *l*; the slips are thus removed out of the way of the latter saw and preserved. The saw *l* revolves horizontally, and is called the "grooving-saw;" it is considerably thicker than ordinary circular saws, and has long teeth, to admit of their receiving of "set," to cut out the whole of the required groove at one operation. The spindle head, which carries the grooving saw, is adjusted and fixed by screws to a bracket attached to the head *o*, the latter being placed in slides which keep it steady, and conduct it in a parallel direction when moved to or from the bench. All the parts which operate on this edge of the board being thus connected, advance or recede together. This movement is effected by means of a screw

fitted with collars to the fixed puppet 3, and working in a nut in the back part of the head *o*: the screw is turned by the handle *n*, and an index on the head *o* points out the relative position of the circular saw *A*, with respect to the other side of the machine, and consequently indicates the various breadths of the finished boards, by pointing to a divided scale of inches, and parts fixed upon the block *c*.

All the saws are fixed on to the spindles in the ordinary way by screws, nuts, and washers; but the spindles are considerably thicker than usual, to admit of their being fitted with cutters or irons, which by cutting horizontally rebate the superfluous thickness of the board, to a sufficient extent, from that part which is destined to form the under side of the floor in all flooring boards. The heads which carry the vertical saws *g h*, are placed on slides fixed to the block *o o c*, their horizontal position being adjusted by regulating screws, worked by the handles *p* and *r*, and their spindles elevated or depressed by proper adjusting screws.

Motion is communicated by endless bands from a large drum wheel above the machine, such bands embracing all the vertical saw pulleys, and also the rigger or pulley *w* of the intermediate shaft *v w*; and this intermediate shaft, by means of half-crossed or twisted bands 4 4, gives motion to the horizontal saws *i* and *l*. The circular plate or plane *f* is also impelled by another half-twisted band 5, from a pulley 6 on the spindle of the saw *g*. The power which impels the whole machine is derived from a steam engine or other prime mover applied to the shaft of the large drum wheel before mentioned.

The Editor of the London Journal (who no longer holds the situation of draftsman in the Inrolment Office, and is in consequence not able to take copies of the drawings and specifications there enrolled, except like us, by memory only) attempted in his November number to give a description of the foregoing invention, but finding his ability unequal to the task, he says, (p. 68) the drawings are "upon so small a scale, that such a reduction of the figures as would be necessary to bring them within the compass of our (his) Journal would render them altogether unintelligible." We have proved the absurdity of this statement by our engraving on wood, in which the difficulty of representing small objects is infinitely greater than on copper-plates. This circumstance we should not, however, have noticed at all, had he not coupled it with some very erroneous observations calculated to injure the patentee, which are put forth as an additional excuse for his not describing the invention; he says, "this machinery is of the same kind as that employed in the dock yard at Portsmouth, and originally projected by Mr. Brunel." Now Mr. Brunel's machinery being for making pulley-blocks, it is obviously impossible there can be any similarity between it and Mr. Mair's flooring-machine; as by the former flooring boards could not be prepared, and by the latter blocks could not be made.

Two machines of the kind we have described have been in use for some time past at Glasgow, and we understand that a large builder at the west-end of London is constructing works for the same purpose under the licence and direction of the patentee. From the great

facility which these machines afford of executing one of the most tedious and laborious parts of house-building, we hope the patentee will be able to establish them in various other parts of the kingdom.

PATENT MODE OF FEEDING FURNACES WITH FUEL,

By JAMES BARRON, of Birmingham.—Dated July 24, 1826.

IN opening the door of the furnace of a steam boiler, in order to supply it with fuel, a large quantity of cold air passes over the fire and rushes up the chimney, which cooling the boiler, materially checks the production of steam; it is, therefore, a very desirable arrangement to supply the furnace with fuel without opening the door, and to cause all the air required for combustion to pass from underneath the grating through the ignited fuel. Numerous plans have been already proposed to attain this object, and Mr. Barron has by his recent patent added another to the list, but we do not perceive that he effects it in a more convenient or economical manner than his predecessors.

A large tube is erected in a vertical position nearly over the furnace; this tube is divided into several compartments, one over the other, by falling bottoms, and having openings at the sides; opposite to each of these openings is a box or tray charged with coal, suspended upon pivots in a vertical frame, in connection with a train of wheels that by their revolution draw up a sliding bar, which bar by means of a click, successively turns over the equipoised boxes of coal into one of the compartments of the tube, the falling bottom in which now giving way, discharges the coals through the tube on to an inclined plane or shoot, which distributes them upon the grate. The bottoms of the several compartments in falling by the weight of the coals, depress the upper end of a long lever, the lower end of which, formed into a rake, is thereby caused to ascend, and rake out the ashes from the fire bars from underneath, just previous to the distribution of the fresh fuel. In this manner the furnace is fed with small quantities of fuel, and at uniform periods of time apart.

ON DETECTING THE ADULTERATION OF BREAD.

TO THE EDITOR.

London, Dec. 4, 1826.

SIR,—I know not the motive which impelled your correspondent, J. H., to inscribe the letter inserted in the 5th number of the Register of Arts, and Journal of Patent Inventions, on the "Adulations of bread with flour, saw, and granite;" whether it be from the desire so obtain information relative to the clumsily and comically, not chymically, directed application of tests, (so called,) which he has given for the detecting of a something in bread which he contends never entered into its composition; or from the satiety, occasioned by his voracious appetite for "plum-pudding;" be that, however, as it may, I intend, as briefly as possible, to notice a few of the remarks of your "plum-pudding" votary.

In the first paragraph of his "prodigious" paradox he informs us, that he has "been much perplexed to conjecture the mode by which the dirty,

heavy, coloured fluor-spar of Derby, could be converted into flour," &c.; and, pursuing the same "prodigious" strain, recapitulates by stating, "that it is as little possible to mistake a mass of baked granite for a quartern loaf, as a mass of boiled saw-dust for plum-pudding;" and, notwithstanding his conviction of the impossibility of the admixture, yet, forsooth, he has given tests (so called), by which these substances may be detected! *Dii rostram fidem!* And he further declares his incredulity to originate in his "prodigious" desire for the "romantic," and, very likely, "plum-pudding." Indeed, Sir, it is probable that the desire of J. H. for truth, is as notorious as that of the old lady, whose son having been at sea, was desired to state the novelties he had seen: the boy, anxious to disclose, said, he had seen flying-fish; the old lady was much enraged at this reply, and was about to inflict some punishment on her son, for what she considered an attempt at imposition. The boy, however, to avoid the unjust chastisement, immediately said, that during their weighing anchor in the Red Sea, it brought up one of the wheels of Pharaoh's chariot. This she believed, and relieved her son from the punishment she had prepared to inflict.

After the manifest inconsistency of J. H., I cannot wonder at the perplexity under which he laboured; since the heads of those, whence emanate similar inconsistencies, appear to me, unlike his loaf, to be composed of the occasional constituents of bread, such as gypsum, felspar, &c. &c.; and, that your correspondent may be assured of the probability of my inference, I beg to inform him, the operation of trepanning will enable him to obtain a sufficient quantity, upon which he may try the perfectability of his tests, (so called.)

Since your "plum-pudding" votary happens not to be of the number of those, by whom such infernal admixtures are made, why does he not adhere to the truth in his quotations? Why does he employ language, in quoting, not employed in the original;—*ambiguous to those not conversant in chemistry; to whom the easy and infallible mode, by the crucible, is recommended?* If truth be his object, why has he not given a demonstration of the inapplicability of the mode which I suggested, for the detection of fluete of lime? for, be it remembered, this mode detects also fel-spar, gypsum, &c., the most common substances employed in adulterating bread; and this mode, I assert, is not only the most ready, but is infallible; wherefore, it was recommended to housekeepers as being also easy of application, unaccompanied by that barbarian arrogance, which inflates the instructions of your "plum-pudding" votary. Moreover, be the author who he may, whence J. H.'s tests have been copied, such as "oxalic acid, water saturated with carbonic acid, or barytic water,—even a solution of any carbonetted alkali," &c. &c.!!! it is not immanifest, that he has been mistaking their application! I would ask your "plum-pudding" votary, and I am sorry to press him at this season of the year; a season, I doubt not, of extreme anxiety to him; I would ask him, in what state does the lime exist in flour; or the loaf, supposing the admixture to be gypsum, or fluete of lime; and of what utility his tests (so called)? I beg to be distinctly understood by J. H., that I hesitate not in stating, that his test of "barytic water," if persevered in, will involve the major part of those bakers, into whose bread lime under any form enters not!

Again, supposing the admixture to be fel-spar, I would direct the housekeeper to the use of the blow-pipe: not that the process by the crucible is fallible; but that it may soil the fingers ready for the dividing of a "plum-pudding."

Finally, I would recommend this chemical luminary to try, if he have the ability, the tests which he has given; and the public to adopt in preference, the analysis of flour or bread by means of a crucible.

I remain, most respectfully,

Sir, your most obedient servant,

G. PHIPPS.

PRIZE ESSAY ON THE LEVER. THEORETICAL AND PRACTICAL.

By G. G. WARD, Machine Maker.

(Continued from p. 62.)

PROPOSITION I.

If two forces act perpendicularly upon a straight lever, they will be in equilibrio when they are reciprocally proportionate to their distances from the centre of motion.

Fig. 4.—Let ABC represent a straight lever, whose centre of motion is B ; W the weight, and P the power; it will remain at rest when W is to AB as BC to P .

Conceive the point C to be moved, till it occupies the situation D , and it will have described the arc CD , and because the lever is inflexible: the point A will have described the arc AE , and we shall then have the angles CBD and ABE subtended by the arcs CD and AE .

But the angles CBD and ABE are vertical, and therefore (*Euclid* Book I. Prop. 15,) they are equal; from whence it follows that the arcs being similar, are to each other (*Euclid*, Book VI. Prop. 33,) as their respective circles; so that CD the velocity of C , is to AE the velocity of A , as BC is to BA .

But the efficacy of a moving power being as its quantity and angular velocity, it follows that the moment of P will be to the moment of W , as the distance BC is to the distance BA from the centre of motion B ; consequently, the quantity of W must be to AB as BC is to P .

Fig. 5 represents a lever of the second kind, where A is the fulcrum, W the weight, and C the power. Imagine the point D to move into the situation E , and it will be evident the same mode of reasoning will apply as was used in treating of the first kind of lever. For here we have the triangles AFG and ADE similar; consequently, as AF is to AD , so is FG to DE ; but FG and DE represent the relative velocities of the weight and power; therefore, the power C must be to the weight W as AF to AD , that is, as their distances from the centre of motion.

The application of this mode of reasoning to the third kind of lever is too obvious to need illustration. To render this proposition, if

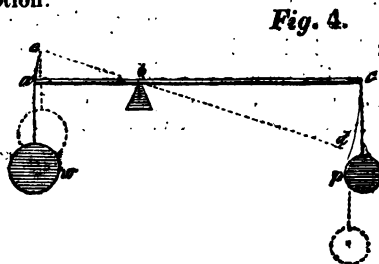


Fig. 4.

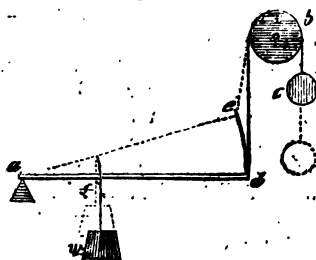
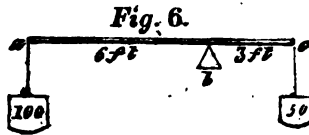
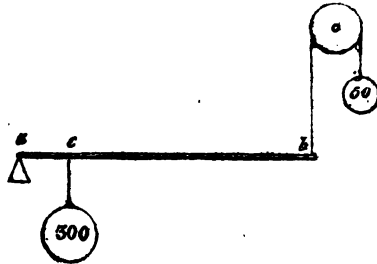


Fig. 5.



possible, still more familiar; let us suppose the arm *AB* of the lever *AC* (Fig. 6) to be 3 feet in length, with a weight of 100 lbs. suspended at its extremity, and let the arm *BC* be 6 feet in length, and a power of 50 lbs. applied at its extreme end, they will then be in equilibrio: for the quantity of the weight multiplied by its celerity, (that is its distance from the fulcrum) is equal to $100 \times 3 = 300$, and the quantity of the power multiplied by its celerity is equal to $50 \times 6 = 300$, and therefore their momenta being equal will mutually destroy each other's effect, and the lever will remain at rest.

Fig. 7.



Again, let *AB* (Fig. 7) represent a lever of the second kind, with a weight suspended at *C*, 18 inches from the fulcrum *A*, and a power of 50 lbs. acting at the point *B* 9 feet from the fulcrum; here we have $50 \times 108 = 5400$. Consequently, a weight of 300 lbs. would be sustained at *C*, for $300 \times 18 = 5400$; or we may state it thus,—
 $AB : AC :: W : P$
 $108 \div 18 = 300 \div 50$

Precisely the same ratiocination applies to the angular or bended lever as was used in the foregoing examples; if the power and weight act at right angles to the arms.

For if the lever *ABC* (Fig. 8) be caused to revolve on its fulcrum *B*, the points *A* and *C*, at which the power and weight act, will generate the circles *ADA* and *EFE* respectively, and as they will act at tangents to those circles it follows there will be an equilibrium when $AB : CB :: W : P$. Or let $CB = 3$, and $AB = 6$, the weight $= 40$, and the power $= 20$; we then have $40 \times 3 = 120$, and $20 \times 6 = 120$; or thus, $AB \div BC = W \div P$
 $6 \div 3 = 40 \div 20$

From the foregoing investigation (by a thorough understanding*

* I have been particularly anxious to render this Proposition as plain and intelligible as possible, as it is the most important part of the subject; and as far as regards the second kind of lever, not generally understood. As proof

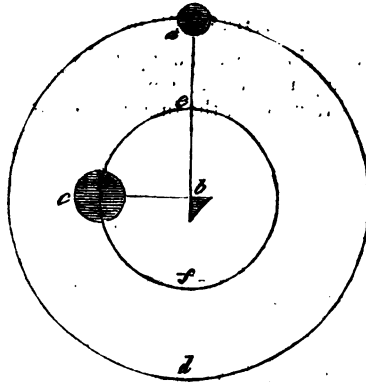


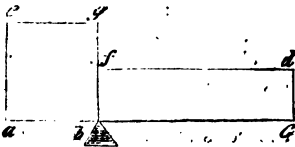
Fig. 8.

of which the student will find his progress very much facilitated) the following Corollaries may be drawn.

Cor. I. From hence it appears, that if two forces acting perpendicularly on the arms of a straight lever keep each other in equilibrio, their quantities will be inversely as their distances from the centre of motion.

Cor. II. From this it will be seen that the efficacy with which any two forces tend to move the arms of a lever, are as the rectangles contained under lines proportional to those forces; and the perpendicular distances of their lines of direction from the centre of motion.

Fig. 9.



For if ABC (Fig. 9) be viewed as a lever, the quantities of whose power and weight are represented by the lines CD and AE, and if DF be drawn parallel to CB, and terminated by a perpendicular from the centre of motion B, and if EG be drawn parallel to AB, and likewise

terminated by a perpendicular from the fulcrum, the lever will be in equilibrium when the rectangles BCD and BAE are equal.

Or thus: let AB be 4, BC 8, CD 2, and AE 4, then we have

$$BC \times CD = AB \times AE$$

$$8 \times 2 = 4 \times 4$$

Cor. III. Hence we see that if two or more forces acting on opposite sides of the fulcrum of a lever keep it in equilibrio, their common centre of gravity is immediately over the prop.

Cor. IV. It follows from hence that the fulcrum or prop will sustain a pressure equal to the sum of the power and weight.

of which, I will adduce an instance from a Work on the Slide-Rule, which has been extensively circulated amongst mechanics.

The example is—A lever, 90 inches long, having the prop or centre fixed at one end, and a force of 50 lbs. lifting at the other: what weight, hung at 16 inches from the prop, may be raised by the above force?—Answer, 250 lbs. This is manifestly erroneous; and as the rule actually produces this result, it follows that all other problems of a similar nature would be erroneously solved.

PROPOSITION II.

If a lever of any kind be acted upon by two oblique forces an equilibrium will take place, when they are to each other inversely as the perpendiculars drawn from the fulcrum to the line of direction of the forces.

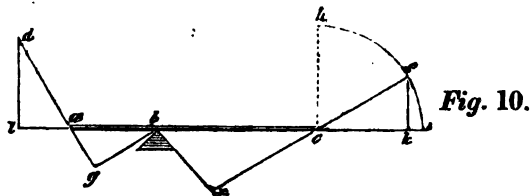


Fig. 10.

Let AD and CE (Fig. 10) represent the quantity and direction of a weight and power acting upon the lever ABC. Produce EC to F, and draw FB perpendicular to EF and passing through the centre of motion B; also produce DA to G and draw GB perpendicular to DG, and passing through the fulcrum B.

Produce KE perpendicular to BC and passing through the extreme point of the line CE, and draw LD perpendicular to AB and passing through the extreme point of the line AD.

We then have the angles ECK and BCF vertical, and therefore equal; and the angles at K and F are by construction right angles: consequently, the triangles ECK and BCF are similar.

But from these triangles being similar, it follows that, as $BC : BF :: CE : EK$, and by pursuing the same process with regard to the representative of weight DA, we shall have: as $BA : BG :: AD : DL$: but EC is perpendicular to BF, and AD is perpendicular to BG; consequently, we have $BF \times EC = BG \times AD$. Therefore as $EC : DA :: GB : FB$; that is, inversely as the perpendiculars drawn from the centre of motion B.

COR. I. Hence it appears, that if a force is applied at any angle on a lever, it resolves itself into two forces; one of which will act perpendicular to the arm of the lever, the other coincident with the direction of the lever: and the two forces thus generated, will be respectively as the sine and co-sine of the angle which the line of direction of the force makes with the arm of the lever on which it acts.

For if the arc HEI be drawn with CE as radius, EK will be the sine and CK the co-sine of the angle ECK.

But it has been shown that EK is the quantity of perpendicular force exerted on the lever ABC, and therefore the remaining or longitudinal force is represented by the co-sine CK.

COR. II. From this it will be seen that a perpendicular position is the only one in which the whole energy of a force is exerted to produce rotatory motion in the arm of a lever, and if this position be altered, part of the effect will be consumed in lateral pressure on the fulcrum.

COR. III. Hence it appears, that in the case of oblique forces the perpendicular pressure on the fulcrum is equal to the sum of the sines

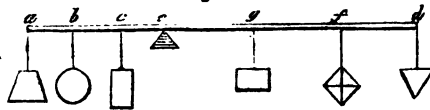
of the angles formed by lines representing the quantity and direction of the power and weight.

Cor. IV. It follows from hence that when the angles formed by the direction of the forces are equal, they will be to each other inversely as their distances from the fulcrum, when an equilibrium takes place; for in this case the sines will be to each other as their respective radii; and the radii represents the power and weight.*

PROPOSITION III.

If several forces act perpendicularly on the arms of a straight lever, they will be in equilibrio when the sum of the products of each force, multiplied by its distance from the centre of motion on one side, is equal to the sum of the like products on the other side of the fulcrum.

Fig. 11.



Let the weights 6 6 6 (Fig. 11) act on the points A B C of the lever A D, whose centre of motion is E; and let the powers 3 3 3 act on the opposite arm of the lever at the points D F G; the quantities of the weights being each equal to 6, and their respective distances from the centre of motion 2 4 and 6, the quantities of the powers being each equal to 3, and their respective distances from the fulcrum 4 8 and 12. As A B and C are at the respective distances 6 4 and 2 from the fulcrum E, and as the forces acting at those points are each equal to 6, it follows that we have for product $\frac{W}{6} \times \frac{A E}{6} + \frac{W}{6} \times \frac{B E}{6} + \frac{W}{6} \times \frac{C E}{2} = 72$, the quantity of momentum operating on the arm

* As this Proposition (II.) is of considerable importance, and as the Rule deduced from it is not very easily reduced to practice, especially when a table of sines is not at hand, I shall take the liberty to propose a Rule by which the efficacy of any power, (its quantity and acting angle given) acting obliquely, may be ascertained. The Rule is founded on this consideration—that the action of all oblique forces is limited to an arch of 90° ; as, when the force acts at an angle of 90° to the arm of the lever it is perpendicular to it, and of course no part of the force is lost in oblique action, and when this angle becomes Zero, the whole of the force is exerted on the lever longitudinally, and can produce no effect in raising the weight. So that we have the Rule thus: as the number of degrees contained in the arch intercepted by the angle formed by the direction of the force is to the number of degrees contained in the complement of the same arch, so is the quantity of perpendicular to the quantity of longitudinal efficacy exerted by the force. *Example.*—Let the quantity of force applied $= 120$, and its acting angle $= 60^\circ$; in this case the quantity of degrees contained in the intercepted arch $= 60^\circ$, consequently, the number of degrees in its complement $= 30^\circ$; and by Rule we have as $60 : 30 :: 80 : 40$. It will be seen by this that the whole of the operation consists in dividing the given force in the same proportions as exist between the arch and its complement, which may be effected by the Common Rule of Proportion. We see that in this example 60° and 30° are the whole number of degrees in a right angle, and 80 and 40 the whole sum of the force of 120.

A E of the lever A D; and as the points G P and D are at the respective distances of 4 8 and 12 from the fulcrum, and each of the forces acting at those points equal to 3, we have $\frac{P}{3} \times \frac{GE}{4} + \frac{P}{3} \times \frac{FE}{8} + \frac{P}{3} \times \frac{DE}{12} = 72$, the quantity of momentum acting on the arm D E of the lever A D. Here, then, the opposing momenta are equal, and the lever will remain at rest.

It must be evident, that in this case the fulcrum sustains the whole of the forces, consequently, the pressure upon it will be equal to the sum of all the forces.

This example might have been viewed as three distinct levers with a power and weight acting on each, but the result would have been precisely the same as above.

(To be continued.)

ON STEVENS'S PATENT STEAM BOAT PADDLES,

By CAPTAIN J. M'ARTHUR LOW, R. N.

Addressed to the Inventor.

London, Nov. 8, 1828.

SIR,—I most willingly comply with your wish, in committing to paper the substance of what I have, in conversation, expressed, relative to your very simple and most useful invention for the propulsion of steam-vessels, by the application of six paddles, in lieu of the wheels now used.

The chief objections to the use of paddle-wheels are,—

1st. That much of the power employed is lost, in consequence of the disadvantageous angles at which their floats enter the water; and also that those angles cannot be changed, according to the speed which the vessel may acquire, or according to the current, favourable or unfavourable to her course, in which she may happen to move.

2ndly. That the floats rise at a disadvantageous angle, lifting a body of water; thereby causing waves and agitation on the quarters, and in the wake of the vessel, which is dangerous to boats in the navigation of rivers, and destructive to the banks in that of canals.

3rdly. That much of the power lost from the disadvantageous action of the wheel as to propulsion, is employed only to strain the vessel, and cause that tremulous or vibratory motion, which is peculiar to steam vessels, and generally unpleasant to passengers.

4thly. That in every kind of swell, the effect of the wheels must be not only greatly diminished, but rendered unequal and uncertain; for one, by the rolling motion, may be plunged so deep as to lose much propulsive effect, whilst strain and friction are thereby increased, and the other may be raised so high, as to have but little hold of the water.

5thly. That the effect of wheels is narrowly limited; for, a certain velocity being once attained, the water has not time to find a level between the floats, or to fill up the spaces so far, that each may produce an effective stroke.

6thly. Wheels cannot be easily removed or unshipped at sea, either for making sail, or for any other purpose required.

7thly. They are liable to such injury from running foul of vessels, and from the stroke of the sea, as cannot be easily, if at all, repaired whilst under weigh; and they require, for guards and splash-boards, cumbersome paddle-boxes, which, according to the sea-phrases, hold a great deal of wind, or, in other words, greatly increase the resistance to be overcome.

It now becomes necessary to notice the action and effect of your paddles, in contrast with the defective action and inconvenience of the wheels, under

shown corresponding heads, to shew in what manner, and to what extent, they excel.

1stly. Little or none of the power employed need be lost; for, by shifting the pivot which unites the radius and guide rods, the paddles may be fixed so as to enter the water, and to rise, at any angle proportioned to the speed of the vessel, the velocity of the stroke, and the effect of current.

2ndly. By rising in a position nearer to vertical, or less inclined to the horizon, than the floats of a wheel, the paddles do not lift, or throw up, a body of the fluid in that action, and do not cause the waves and agitation called backwater; so that no danger to boats, or other inconvenience from such cause, can be produced in rivers, nor can any injury be done to the banks of canals.

3rdly. The angle, at which the paddle-blades should meet the surface, being properly ascertained and regulated, nearly the whole effect is propulsive; and no straining, tremulous, or vibratory motion of the vessel, which proceeds from the resistance of the water in opposite directions to the descending and ascending floats of a wheel, can possibly be felt.

4thly. In a swell, the paddles can be fixed at any angles, each differing from the other as much, as to ensure a tolerably equal action on each side of the vessel, at the same instant, let the roll be what it may.

5thly. The motion of your paddles being through spaces parallel to each other, they are sure, at every stroke, to find a sufficient hold or fulcrum; for the water displaced by any of them, cannot sensibly affect or diminish that in which the others have to act. Their velocity may, therefore, be increased with effect, until speed be limited by accumulated resistance to the vessel's lateral motion.

6thly. From the manner in which your paddles are attached to the radius rods and cranks, they may not only be easily unshipped for taking advantage of fair winds, but, when damaged, may be shifted in five minutes; or, if spare paddles be not carried, they can be got within-board, one at a time, for repair, the rest continuing in action.

7thly. In cases of running foul, less space being filled by the paddles than by a wheel, and the pivots which unite the radius and guide rods being easily removable, to give all or any of them play, or as they could be slung and dropped loose from the cranks also, danger of damage must be thereby diminished; but if one paddle get damaged, as might happen from a shock that would render a wheel useless, the vessel could still proceed on her voyage, supposing no spare paddle on board. Now, from the relative position of the paddles, one just about entering the water, and another leaving it, when the third is at its greatest immersion; or both being so posited when the third is completely raised, and also from the small extent of surface each paddle presents to the roll of the waves, they are by no means liable to injury from the strokes of the sea. In consequence of those advantages, and that of not throwing up water, or dashing it into spray, the place of cumbersome paddle-boxes may be supplied by guard-irons, holding but little wind, and presenting scarcely any impediment to progression.

There remain advantages not alluded to under the foregoing heads, viz. length and horizontality of stroke, with depth of immersion. Their value I cannot better express than by stating, that when your paddles enter the water at an angle of 30 degrees, the length of stroke, and depth of immersion, are each equal to what would be obtained by a wheel, of one-third the diameter beyond the proportions now generally used, and the advantages over every possible modification of the wheel thence arising, they must even retain.

Upon the whole it seems to me evident, that with your paddles, engines of 60-horse power may produce nearly the same effect as those of 100-horse power with the wheel, and that the expence saved by their use may fall between 35 and 40 per cent.

The gain of space for stowage, afforded by diminished bulk of engine, and store of fuel, must in many cases deserve serious consideration, and the power of the paddles for backing, either from danger or for expedience, is an advantage that wheels, improved by any plan of feathering their floats, are not likely ever to possess. In short, I am justified in believing, that steam vessels,

propelled by your paddles, will, from absence of backwater prove the safest and best for river and canal navigation; the most economical as to wear and tear, cost of engines, and consumption of fuel; the most agreeable to passengers, as concerns tremulous motion: and, to conclude, the best adapted for general purposes at sea, but more especially for long voyages; because smaller engines and less fuel will afford more room for all purposes; because spare paddles may be easily stowed; and because, by unshipping the paddles, trade, periodical, regular, or even favourable winds of short duration, could better be made available; and in bad weather, if needful, the vessel could thereby be adapted for lying-to with ease and security.

I cannot close without comparing your paddles in action and effect with those, skilfully employed, for the propulsion of canoes, by the natives of Asia, Africa, America, and the Islands of the Pacific Ocean, whose practice I have carefully observed, and in the course of service often adopted, both in flat-bottomed boats for landing the greatest number of troops, and for approaching the enemy at night, without noise, in those of a different construction: and by precept, observation, and experience, I have been taught that the greatest effect is attained from the use of the paddles, when by their action the water is least agitated. For attaining this perfection in using a paddle, the inner arm of the rower, right or left, guides the upper part of the handle, which is held close to the knob at its end, whilst by the hand of the outer arm it is held near its bearings, or at about two thirds of its length, downwards. The arms are then extended, the body being bent forwards, and for the first few strokes the paddle, when it touches the water, is inclined to the horizon in an angle of 15 degrees, or thereabouts, and becomes vertical in a line, passing transversely just before the man's body. After reaching that point the outer arm drawn back gives all the propulsive effect possible, whilst the inner one, or, indeed, both at the same time, are raising the paddle so as to quit the surface at an angle equal to that at which it entered. These angles, however, as speed is attained, are gradually increased, so as to lengthen the stroke, until they reach about 45 degrees; the velocity of the strokes being also increased as much as possible, together with the rapidity of succession. The inner, or upper arm of the rower, is well represented by the radius-rod of your invention, the fork of which holds the head of the guide-rod or paddle handle, whilst the crank will be found to act very nearly as the outer or lower arm of the rower; and the direction of its motion seems precisely that of the lower arm during the stroke, or time of its propulsive effect.

The paddle and the oar, through all times, and in all parts of the world, have kept their places, as instruments of propulsion by muscular power. On the Clyde and elsewhere, wheels, worked by winches or otherwise, have, at different times, been tried, but invariably failed; until the elasticity of steam offered a power that could, in part, be spared to overcome their defects. Your invention, I may therefore say, appears one of the simple and universal modes of propulsion, to give the full effect of steam, as a motive power, to the most extensive purposes of navigation. That it may afford the ample reward which your labours merit, is the sincere wish of

Sir, your most obedient servant,

Mr. J. L. Stevens.

J. M^r ARTHUR LOW,
Commander, Royal Navy.

P. S. I have throughout supposed the use of one paddle-blade only to each crank. Four of them, or, indeed, more than one to each, takes away, in appearance at least, from the simplicity of the invention, and adds to the weight of the paddles, as well as to the cost of adopting your plan, without producing in any case an adequate advantage, and no advantage whatever in one case out of a thousand.

MISCELLANEOUS INTELLIGENCE.

THE GREAT CANAL OF THE NETHERLANDS.—The object of this canal, which is the largest in Europe, is to afford a passage for large vessels from Amsterdam to the sea. This city has 40 feet of water in the road in front of its port; but the Pampas or bar in the Zuyder Zee, 7 miles below, has only a depth of 10 feet; and hence all ships of any considerable burden have to unload part of their cargoes with lighters, before they enter the port. As the sea in question is full of shallows throughout, all ordinary means of improving the access to the port were necessarily ineffectual; and the resolution was therefore at length adopted, of cutting a canal from the town of Helder, the northernmost point of the province of Holland. The distance between these points is 41 English miles, but the length of the canal is 50½. The breadth of the surface of the water is 124½ English feet, the breadth at bottom 36 feet, the depth 20 feet 9 inches. Like the Dutch canals generally, its level is that of the high tides of the sea from which it receives its supply of water. The only locks it requires, of course, are two tide-locks at the extremities; but there are, besides, two sluices with flood-gates in the intermediate space. It has only eighteen bridges (drawbridges) in its whole length. The locks and sluices are double, that is to say, there are two in the breadth of the canal; and we learn from Mr. Balt, that their construction and workmanship are excellent. They are built of brick for economy, but bands of lime-stone are interposed at intervals, and these project about an inch beyond the brick, to protect it from abrasion by the sides of the vessels. There is a broad towing-path on each side, and *the canal is wide enough to admit of one frigate passing another.* From the river Ye at Amsterdam, it proceeds north to Purmerend, thence west to Alkmaar lake; thence, north by Alkmaar, to a point within two miles of the coast, near Petten; and it continues to run nearly parallel to the coast from this point to the Helder, where it joins the sea, at the fine harbour of Nieuwediep, formed within the last thirty years. At the latter place there is a powerful steam-engine, for supplying the canal with water during neap-tides, and other purposes. The time spent in tracking vessels from the Helder to Amsterdam, is eighteen hours. The Helder point is the only spot on the shores of Holland that has deep water; and it owes this advantage to the island of Texel opposite, which, by contracting the communication between the German ocean and the Zuyder Zee to a breadth of one mile, produces a current which scours and deepens the channel. Immediately opposite the Helder, there is 100 feet of water at high tides, and at the shallowest part of the bar to the westward there is 27 feet. In the same way, the artificial mound which runs into the lake or river Ye, opposite Amsterdam, by contracting the water-way to about 1000 feet, keeps a depth of forty feet in the port, (at high water,) while above and below there is only 10 or 12 feet. The canal was begun in 1819, and finished in 1825. The cost was estimated at 10 or 12 millions of florins, or about one million of pounds sterling.

CITRIC ACID FROM GOOSEBERRIES.—Mr. Lilley has obtained citric acid from this fruit, at an expence less than half the usual price of acid in France. The gooseberries are to be bruised and fermented; the alcohol formed, distilled off, and the residue pressed to extract the liquid. The latter is to be heated, and carbonate of lime added as long as effervescence is occasioned. The citrate of lime is then to be collected, drained repeatedly, washed, and then pressed: it is still coloured, and mixed with malate of lime: it is to be mixed with water until of the consistence of thin syrup, heated, decomposed by sulphuric acid, and the whole diluted with twice its weight of water. The fluid separated from the precipitate is to be again treated with carbonate of lime: and now the precipitate, when collected in a filter, is to be well washed, pressed, and a third time decomposed by sulphuric acid. The clear liquor now obtained is to be boiled with animal charcoal, filtered, and evaporated. When sufficiently concentrated, it must be allowed to deposit, and the fluid, when poured off, be put into stoves heated to between 68° and 77° Fahr. Crude crystals of the citric acid will thus be obtained; they are to be drained slightly, washed, and re-crystallized.—*Journal de Pharmacie*.

FALL OF AN AEROLITE.—The following account of an aerolite, weighing 36 pounds, which fell at 11, A. M., Sept. 14, 1825, at Vaigoa, one of the Sandwich Islands, is given by a lieutenant of Captain Kotzebue, in his recent voyage round the world. A short time previous to its fall, the sky became charged with clouds, until the whole island was covered with a dense black veil. The fall of the stone was immediately preceded by a violent gust of wind from the north-west, and, even at sea, sounds like those of thunder were heard. Immediately after these detonations, the aerolite fell in the middle of the village of Gangaur, and broke into pieces on touching the ground. The Russian travellers gathered many of these pieces, one weighing 15 lbs. They resemble the aerolites generally known.

COCHINEAL INSECTS—have been introduced into Spain from America, and they thrive well in the neighbourhood of Cadiz. From Cadiz a quantity of them were lately carried to Malta, on account of the British government, by Dr. Gorman, and it is said they are likely to do well in that island. The plant *apuntia*, or prickly thorn, on which they subsist, abounds on all the coasts of the Mediterranean.

TO OUR READERS AND CORRESPONDENTS.

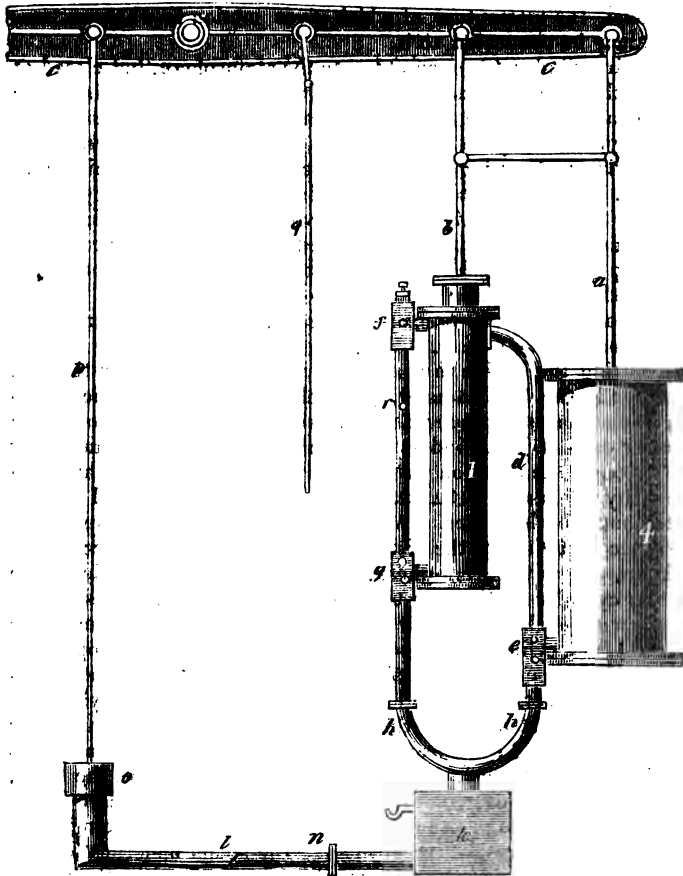
SKEENE'S PATENT PADDLES.—We received the following just before going to press. "SIR,—Having received a Note from Mr. Skeene pointing out an error in my account of the experiment on board the *Sons of Commerce*, on the 19th ult., I request to be allowed to correct the same. By a mistake in the addition, I made the time taken by the paddles, when lashed, to be 1 h. 8' 59"; it should have been 1 h. 9' 34": and as the patent paddles required 1 h. 10' 39" it will be seen that they lost only 55" instead of 1' 30", as stated in my former Letter.

"Your insertion of the above will oblige, Sir, yours, &c.

"J. MURDOCH, Mechanical Draftsman,

"4, Vittoria Place, Mile-end Road."

No Patents passed the Great Seal last month, in consequence of the King's illness.



PATENT STEAM AND AIR ENGINE,

By THOMAS TIPPETT, of Gwennap, Cornwall.—Dated October 9, 1828.

THE above diagram is explanatory of a new modification of the steam engine, by a practical engineer; the specification of the patent for which has just been enrolled. It combines the principles of the high-pressure, working partly by expansion, the condensing, and the atmospheric engine.

There are two working cylinders, one which we will term the air cylinder, and mark 4, the other the steam cylinder, and mark 1, (as those figures denote the proportionate capacities of the two); the pistons in each work together in the same direction; their rods *a* and *b* are therefore connected to the reciprocating beam *c*, upon one side of the fulcrum, and at the end of the beam on the other side (not shown) the power is communicated by means of a rod and crank to

a fly wheel, the momentum of which gives motion to whatever machinery may be connected to it.

The air cylinder 4 is open at top to the atmosphere, but closed at bottom; the steam cylinder 1 is closed at both ends; *d* is a pipe communicating from the top of the steam cylinder to the bottom of the air cylinder 4 by the valve box *e*: *f* and *g* are also valve boxes for supplying and cutting off the steam on each side of the piston in the steam cylinder 1: *h h* is an eduction pipe from both cylinders leading to the condenser *k*: at *l* is a valve in the pipe *n*, leading from the condenser to the air pump *o*, worked by a rod *p* attached to the beam *c*: *q* is a rod by which the apparatus connected with the valves are worked, but which is not introduced into the drawing, as they are of the ordinary construction: the steam from the boiler is received at *r* for working the engine.

In setting the engine to work, steam is allowed to blow through the engine in the usual manner, to expel the air and heat the cylinders; the action is commenced by opening the communications with the lower ends of the cylinders for supplying them with steam under their pistons; the eduction valves leading to the condenser are then opened, by which means the steam is condensed, and a partial vacuum effected under both pistons. At that instant steam at a high pressure is introduced at *f* above the piston in cylinder 1, which forces down its piston, and as the atmosphere at the same time presses down the piston in cylinder 4, they are thus propelled together. This action leaves the atmosphere pressing upon the piston at the bottom of the cylinder 4, and cylinder 1 full of steam. To overcome these opposing forces, and reverse the action of the pistons, the communication between the upper end of cylinder 1, and the lower end of cylinder 4 is opened, while steam from the boiler is introduced at *g* under the piston in cylinder 1; the excess of force of the fresh steam drives the small piston upward, while the steam that was above the same, acting expansively, overcomes the pressure of the atmosphere in the cylinder 4 driving its piston also upward. Both pistons being again at the top of their respective cylinders, the steam underneath them is again condensed, and the downward stroke repeated by the united force of high-pressure steam and that of the atmosphere, in the manner already described.

This arrangement appears to us both novel and ingenious, and calculated to afford some advantages; to discuss the merits of it, will however, require more consideration than we have at present the opportunity of bestowing.

PATENT STEAM-ENGINE BOILER,

By THOMAS TIPPETT, of Gwennap, Cornwall.—Dated October 9, 1832.

THE object of the patentee in this boiler has been to expose as extended a surface as possible of water to the influence of the furnace. Fig. 1 represents a front-end view, and fig. 2 a side view; the same letters of reference in each referring to similar parts. *a* is a double cylinder of the usual construction of the cylindrical boiler, the internal

Fig. 1.

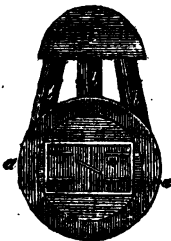
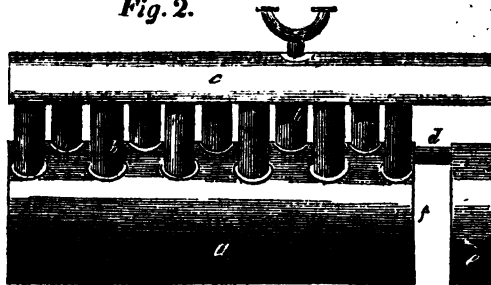


Fig. 2.



cylinder constituting the fire place and flue. From the external cylinder which contains water proceed three rows of open vertical pipes *b b b*, which support a semi-cylindrical vessel *c*. At the furthest extremity of the cylinder *a* proceeds horizontally a short open pipe *d*, which communicates with a small supplementary boiler *e*, which is a cylinder of the same area as *a*, but very short.

This boiler is built in a furnace, in which the flues are so arranged that the heated air in passing out at the end *f* of *a*, shall impinge against the vertical side of the supplementary boiler; the flue thence proceeds upward, and along the underneath flat side of the semi-cylindrical vessel, and between the vertical tubes to the front of the boiler; here it descends and passes under *a*, round the back of the supplementary boiler, then rises again over the top of the semi-cylindrical vessel, and proceeds to the chimney, which is in front nearly over the furnace doors.

PATENT CAPSTAN AND WINDLASS,

By R. HINDMARSH, of Newcastle-upon-Tyne.—Dated February 1, 1827.

This capstan is externally of the ordinary figure, and is worked in the same manner; but it contains a train of wheels which can be brought into operation at pleasure, by which the power can be accumulated with a slower motion.

The barrel (round which the cable is coiled) turns loosely upon a vertical spindle fixed to the deck; on this barrel is fixed a circular rim containing teeth on its inner side. To the drum head, which revolves upon the same central spindle, is fixed a frame work which carries three pinions whose teeth take into those of the circular rim, and on the top of the spindle there is fixed a pinion, which gears centrally into the three pinions last mentioned, so that when the wheel power is employed, the motion of the drum head is communicated to the central pinion, which moves the surrounding three pinions, and these turn the rim which is fixed to the barrel; so that power is increased in the proportion of the difference between the circumference of the central pinion and that of the toothed rim: the speed in which the barrel revolves is of course reduced in the same proportion.

But as it is disadvantageous to reduce the speed, when the additional power is not required for the work, the central pinion by which the motion is communicated, is drawn up into the drum head by means of a screw, which disengages it from the other wheels; the drum head is then bolted to the barrel, and the capstan operates precisely the same as the common machine. The arrangement is a convenient one, as the power can be added or subtracted in a minute to suit the emergency of the case, and according to the number of men employed to work it.

As a windlass may be regarded as a horizontal capstan, we need not describe to our readers the obvious manner of applying similar gear to it, which the patentee includes in his specification.

**PATENT METHOD OF PREPARING CUTLERY AND
OTHER HARDWARE,**

By WILLIAM SMITH, of Sheffield, Merchant—*Dated February 21, 1827.*

THE usual method of preparing table knives, and many other articles of cutlery, is to forge the principal parts, namely, the tang, shoulder, and back, of iron, and weld to the latter a small portion of steel to form the cutting part. The patentee proposes to make the whole of steel, and compensate for the increased cost of metal by rapidity of manufacture.

A pair of solid steel rollers are to have recesses sunk in the surfaces of their peripheries, corresponding with the figure of the articles to be produced; according to the length and thickness of which will their arrangement on the rollers depend, some being in the direction of the axis, and others in the direction of the periphery. The specification enters into some particulars on this head, which appeared to us needless to detail. The steel being heated is applied between the rollers, and these being turned by an adequate power press the steel into the cavities, by which means they are roughly prepared for the subsequent operations of grinding, tempering, &c.

We must confess we were somewhat surprised at such an invention emanating from Sheffield, where the wits of the people are proverbially as acute as their famed manufacture; but we observe that the inventor is a merchant, whose avocations do not of course lead him much into workshops, or amongst mechanics, or he would probably have learned that the same proposition was made many years ago, and we believe was abandoned as ineligible. We heard at the time that knives, scissors, and nails were made by the process, but we always doubted the economy of it from the great expense of the apparatus, and the difficulties attending the accomplishment of the manufacture, in such a manner as to compete with those made in the usual way. *Stamping* is in our opinion a process much better calculated to effect the object. When the manufacturer thinks it worth his while to weld such little bits of iron and steel together as before mentioned, rather than use all steel (worth only about 6d. per lb.), the labour attending it must be so trifling as to do away with the advantage of Mr. Smith's process, supposing it to be a practicable

one: and we conceive that a table knife partly iron and partly steel to be preferable to one made entirely of steel, as not being so liable to snap.

There is, however, one process in Mr. Smith's specification that we much approve of, which is, to make the moulds of such articles as shoemakers' rasps, between two eccentric rollers; as these afford a very facile and elegant means of preparing pieces of flat steel, tapering thinner at each end: and we do not see the impracticability of extending this mode of operating to the preparation of the moulds for various other kinds of files, especially those used by farriers. The idea is excellent, and capable by various easy adjustments and modifications to numerous applications.

METHOD OF CLEANING SILK, WOOLLEN AND COTTON GOODS,

By MRS. ANNE MORRIS.

TAKE raw potatoes, wash them, grate them to a pulp over water; pass the liquid through a coarse sieve into another tub of clear water; let the mixture stand until the fine white particles (or starch) are precipitated: then pour off the liquor for use.

Lay the article to be cleaned over a linen cloth upon a table, and with a sponge dipped in the potatoe liquor, wet and rub the article to be cleaned, repeating the affusion till the dirt be loosened; wash the article in clean water repeatedly; then dry and smoothen.

Two middle-sized potatoes are sufficient for a pint of water.

The white powder, or starch, separated from the liquor at the bottom of the tub, after being washed by repeated affusions of water, forms an excellent substitute for tapioca, as a nourishing food with soup or milk. The coarse pulp which does not pass the sieve is of great use in cleaning worsted or woollen curtains, tapestry, carpets, or other coarse goods. The liquor cleans the finer kinds of silk, cotton, and woollen goods, without injury to the texture or colour. It is also useful in cleaning oil paintings, or soiled furniture. Dirty painted wainscoting is also effectually cleaned by wetting a sponge in the liquid and rubbing it with a little fine sand over the wainscot.

INQUIRY RESPECTING STEAM-ENGINES & BOILERS,

With Observations by the Editor,

SIR,—I will take it as a particular favour, Mr. Editor, if you can inform me through the medium of your very useful Magazine, the most effective and portable steam generating apparatus; whether Mr. Perkins's, Mac Curdy's, or Mr. James's, which have been described by you in the different numbers of the Register. In the 3rd vol. of your scientific work I see a description of Dr. Alban's generator: the engine you say will be described in a future number; since that time I have seen no further notice of it. As I want a generating apparatus and engine of 6-horse power, to mount upon four wheels for agricul-

teral purposes, to be drawn occasionally by two or more horses, it will be necessary it should be as light as is consistent with safety; say two tons or so, complete.

Now, your information upon any of the above generators as to their effective operation, consumption of coal per horse-power, the maker's name and address, and where any of the above can be seen in daily work, will greatly oblige me, and possibly more of your numerous readers.

I am your obedient Servant, &c.

Malton, Dec. 18, 1828.

JOHN JOHNSON, Jun.

[As we do not wish to take upon ourselves the responsibility of recommending particular inventions, we insert the above Letter in order that all those whom it may concern may reply to it themselves.

With respect to the four boilers mentioned by our correspondent, we have no hesitation in stating that James's is the best adapted to the purpose mentioned, on account of its superior portability and compactness: it is likewise perfectly safe from explosion, having no separate steam chamber, and the tubes being proved capable of sustaining two tons upon the inch! Very little heat is misapplied, as by the downward direction of the flue the heated air and flames are verberated over every part of the tubular cylinder. This boiler can likewise be very easily cleaned of sediment or incrustations, which is a difficulty in most other tubular boilers.

Gurney's boiler, described in Vol. ii. N.S. p. 20, is a very excellent apparatus, but it has not the qualities of freedom from danger, and compactness, in so eminent a degree as James's.

Dr. Alban's apparatus is (at least for the present) abandoned; practical experience having developed difficulties which were found to be insurmountable.

With regard to the high-pressure engine required by Mr. Johnson, we think he might suit himself near to home, namely, at the manufactory of Messrs. A. Christie and Co. at Sheffield; at all events he might "go farther and fare worse;" one of the excellent engines of this firm is described in Register No. 108, first series.

The foregoing Letter has led us to give the subject of boilers some consideration, which we submit to our readers in a separate paper in the present number.]

ENGRAVED PRINTING ROLLERS.

"An invention has just been perfected, after great expense and incessant labour, which to calico printers is a grand desideratum. It is a machine by which the most minute and delicate figures may be etched on a cylinder, superseding the tedious process now in use, and without the slightest deviation in the pattern, if there be even tens of thousands of objects to be engraved. It is a truly astonishing invention; for, besides all its other advantages, there is a considerable saving both in labour and expense, and it may be worked by a boy."—*New Monthly Mag.*

PRIZE ESSAY ON THE LEVER. THEORETICAL AND PRACTICAL.

By G. G. WARD, Machine Maker.

(Continued from p. 76.)

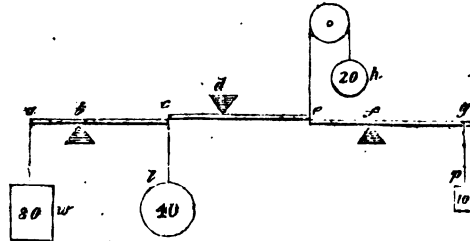
PROPOSITION IV.

If, at the extremities of a system of levers, a power and weight act, they will be in equilibrio, when they are to each other as the continually multiplied products of the arms on one side of the fulcra, to the continually multiplied products of the arms on the opposite sides of the fulcra.

In the system of levers represented by Fig. 12, call each of the shorter arms (ab , cd and ef) 4, and each of the longer arms (bc , de and fg), 8. Let the power p equal 10, and the weight w equal 80, the respective products will then be as follows; $\frac{ab \times cd \times ef}{4 \times 4 \times 4} = 64 \times \frac{w}{80} = 5120$, which represents the momentum of the weight w , and $\frac{bc \times de \times fg}{8 \times 8 \times 8} = 512 \times \frac{p}{10} = 5120$. Here then the products on each side are equal, and the lever is in equilibrium.

This proposition may be elucidated by another mode:

Fig. 12.



Suppose gfe to represent a simple lever (the proportion remaining the same as in the first example), with a power of 10 acting at the extremity of its longer arm fg , then the efficacy of this lever will be $\frac{fg \times p}{ef} = \frac{8 \times 10}{4} = 20$. Consequently, a weight of 20 would be sustained at the point e of the lever efg .

But this weight of 20 may be represented by a power h acting upon e , in the lever edc ; which may then be viewed as a simple lever, whose efficacy is $\frac{de \times h}{cd} = \frac{8 \times 20}{4} = 40$, which is the quantity of weight sustained at the point c of the lever cde .

But this weight may also be represented by a power l of 40, acting on the point c of the lever cba , and by considering this as a simple lever, we have $\frac{bc \times l}{ab} = \frac{8 \times 40}{4} = 80$, the quantity of weight

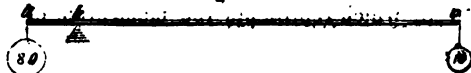
which would be sustained at the point *a* of the lever *cba*, which is precisely the same result as was obtained by the first mode of investigation.

The different proportions may be stated in the following manner:

$\frac{8 \times 8 \times 8}{4 \times 4 \times 4} = 512 \div 64 = 8$, which is the proportion of the longer arms to the shorter, as in this case the shorter arms will be unity: so that as $1:8::10:80$, the two last numbers representing the quantities of the power and weight.

It will be evident, on considering this Proposition, that a single lever may be made equal in effect to a system of levers; for if the longer arm of the lever *abc*, Fig. 13, be made equal to $\frac{8 \times 8 \times 8}{4 \times 4 \times 4}$ and the shorter arm *ab* be made equal to 1, we then shall have a simple lever equal in effect to the compound levers represented in Fig. 12.*

Fig. 13.



To ascertain the quantity of pressure on each of the fulcra in a system of levers, we have only to regard each as a simple lever, acted upon by a force and resistance, the sum of the quantities of which will be the pressure which the fulcrum of the given lever will sustain.

Example.—Let it be required to ascertain the amount of pressure on the fulcrum *f* of the lever *eg*, in the system represented by Fig. 12. Here the arm *fg* is to the arm *fe*, as 8 to 4, or 2 to 1: consequently, the power of 10 at the point *g*, would exert a force of 20 at the point *e*, and the sum of these forces is the quantity of

* By considering the nature of the last part of Proposition IV. and referring to the similar Proposition in the Prize Essay of last year, it will be seen, that the author of that essay has misunderstood the nature of the analogy between a system of levers, and an equivalent simple lever, as the corollary he has deduced from his demonstration is erroneous; as he states, that if we remove the fulcra *f* and *d*, (taking Fig. 13 as example,) and imagine the sum of the arms from *g* to *b*, to represent the longer arm of the then simple lever *abg*, the same power and weight will continue to balance each other as in the system. But this I believe can never happen, except in the identical example which I have chosen, or at least in such as the same proportions are retained; for if we change these proportions, the same results will not be produced. Thus, call each of the longer arms in Fig. 12, 3, and each of the shorter arms 1, the efficacy of the whole system would then be as 27 to 1. But by removing the fulcra *f* and *d*, and supposing *bg* to represent the longer arm of the lever *abg*, this arm would then contain 11 times the quantity of *ab* the shorter arm. Consequently, the power of the lever thus constructed would be 11 to 1, while we have seen that the efficacy of the system of levers was equal to 27 to 1. Therefore the corollary in question does not apply to any cases, save and except the one which is represented in Fig. 12, where the sum of the arms is equal to the multiplied products. I shall have occasion to notice this subject again, in treating of the perpetual lever action; where the same author has carried his own corollary into practice in calculating the power of a machine, and of course produced an erroneous result.

pressure on the fulcrum e ; but $20 + 10 = 30$, which is the quantity of pressure on e . By the same method, the quantity on d would be $20 + 40 = 60$, and the quantity on b $40 + 80 = 120$.

Or thus: the quantity of pressure on $f = p + e$

$$\frac{f}{d} = \frac{p + e}{e + e}$$

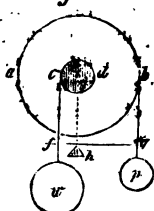
$$\frac{f}{d} = \frac{p + e}{e + e}$$

As the wheel and axle is but a modification of the lever, it must be evident that the same mode of reasoning is applicable, as was used in treating of the lever in its simplest form.

PROPOSITION V.

In a wheel and axle, the velocity of the power is to the velocity of the weight, as the circumference of the wheel to the circumference of the axle.

Fig. 14.



Let ab (Fig. 14) represent the diameter of the wheel, and cd the diameter of the axle; then, by applying a power at p , its efficacy will be transmitted (by means of the cord to which it is attached) to the point b , and will act at a tangent to the wheel ab ; and if this force be applied till the wheel has made one revolution, it is evident the power will have descended through a space equal to the circumference of the wheel.

But as the axle is fixed so as to revolve with the wheel, this will also have made one revolution in the same time as the wheel. Consequently, the weight w will have ascended by means of the rope connecting it with the axle, through a space equal to the circumference of the axle: and since the velocities are as the spaces described in the same time, we have the velocity of the power to the velocity of the weight, as the circumference of the wheel to the circumference of the axle. This will enable us to prove the truth of Proposition VI.

PROPOSITION VI.

A power and weight acting upon a wheel and axle, will be in equilibrium when the power is to the weight, as the circumference of the axle to the circumference of the wheel.

We have seen (by Prop. V.) that the velocities of the power and weight are as the circumferences of the wheel and axle.

But the quantity of a force, multiplied by its velocity, is the measure of its efficacy.

Consequently, there will be an equilibrium when the quantity of the weight, multiplied by its velocity, equals the quantity of the power multiplied by its velocity, and the power will be to the weight, as the velocity of the weight to the velocity of the power; and as, in these 4 quantities, the first is to the second as the third to the fourth, it follows, that the 1st multiplied by the 4th, equals the 2nd multiplied by the 3rd. Therefore, the power multiplied by its velocity, equals the weight multiplied into its velocity.

It will be seen, on reference to Fig. 14, that the wheel and axle is but a lever of the first kind; which may be proved, by producing the perpendicular lines from the acting points of the wheel and axle, (that is $b c$ and the centre e .) to the line $f g$; and that line will then represent a lever of the first kind, whose fulcrum is k , with the power p and weight w acting at its extremities f and g .

We may therefore calculate the power of this instrument, by using the radius of the wheel and the radius of the axle to represent the acting arms of the lever. For example:—let $b e = 30$, $e c = 5$,

$p = 10$, and $w = 60$, then we have $\frac{b e}{e c} \times \frac{p}{w} = \frac{30}{5} \times \frac{10}{60}$ or thus:

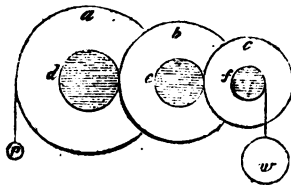
$$\text{as } \frac{c e}{b e} :: \frac{p}{w} \quad \text{as } \frac{5}{30} :: \frac{10}{60}$$

But the most general application of the principle of the wheel and axle, is by means of wheels of different diameters working together at their peripheries, which, if furnished with cogs, are then called wheels and pinions, or if by the intervention of straps, they are generally termed riggers. The latter being mostly used to transmit force in the direction of a plane, parallel to the moving power, and as they are generally used to convey power or velocity to considerable distances from the motive force, the expense of construction is much less than that of a train of wheels and pinions.

PROPOSITION VII.

In a combination of wheels and pinions there will be an equilibrium, when the power is to the weight, as the product of the continually multiplied radii of the pinions to the product of the continually multiplied radii of the wheels.

Fig. 15.



Let $a b c$ (Fig. 15) represent three wheels, whose respective radii are 20, 16, and 12; and let d, e , and f represent three pinions, whose respective radii are 8, 6, and 4. Let a power of 1 be applied at the circumference of the wheel a , and a weight w suspended from the pinion f , which, in this case, will represent

the axle: our proportions then are as $\frac{a}{20} \times \frac{b}{16} \times \frac{c}{12} :: \frac{d}{8} \times \frac{e}{6} \times \frac{f}{4} :: \frac{w}{1}$. Consequently, a weight of 20 would be sustained at f , by a power of 1 acting at a .

But as the circumference of circles are directly as their radii, and as when those circumferences are furnished with cogs, it is necessary that those cogs should occupy equal portions of the circumference; it follows, that the proportions of any two wheels will be as the number of cogs on their respective peripheries; so that the velocities of any number of wheels and pinions may be discovered, if we know their respective numbers of cogs, and their situations.

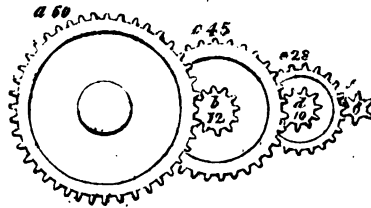


Fig. 16.

To illustrate this, let *a* (Fig. 16) represent a wheel of 60 cogs, acting upon the pinion *b* of 12 cogs, on the same axis with which is a wheel *c* of 45 cogs, which acts upon the pinion *d* of 10 cogs, which carries on its axis the wheel *e* of 28 cogs, which operates on the pinion *f* of 6 cogs. Our proportions then assume this arrangement :

$$\frac{a}{60} \times \frac{c}{45} \times \frac{e}{28} = 75600, \text{ which is the ratio of the velocity of } f;$$

$$\text{and } \frac{b}{12} \times \frac{d}{10} \times \frac{f}{6} = 720, \text{ the ratio of velocity of } a.*$$

* There is one subject in the consideration of the lever in the form of wheels and pinions, which appears to have been omitted in all works on Mechanics which have come under my observation. I shall, therefore, endeavour to explain it in this place.

It must be evident, on consideration of Fig. 16, that other numbers might have been assigned to the various wheels and pinions, while the final velocity would have remained the same. Thus, the pinion *b* might have been transferred to the place of the pinion *f*, and the pinion *f* have occupied the situation of the pinion *b*; and by this transfer the final velocity would not have been altered, but a material alteration would have taken place in the velocities of the intermediate wheels. And this is of some importance when, as is often the case, assigned velocities are required in any particular stage of the combination: and this is frequently necessary, when the parts of the combination are carried through different apartments, in which the operations performed require a given velocity to execute them. Thus, suppose the final velocity required was 105, as in Fig. 16, while a velocity of 5 was required in the wheel *c*, (the velocity of *a* being unity,) it is evident, that in this case the pinion *b*, which is driven by the wheel *a*, must bear the same proportion to it as 1 does to 5; and as the wheel *a* contains 60 cogs, the pinion *b* must have 12 cogs, which are the proportions assigned in Fig. 16. But if the velocity of *c* is required to bear to *a* the proportion of 10 to 1, and the final velocity to remain the same, a different arrangement becomes necessary. We must now place the pinion *f* on the axis of the wheel *c*, and transfer the pinion *b* to the place of *f*; and as the pinion *f* contains 6 cogs, and will then be acted upon by the wheel *a* of 60 cogs, it follows, that it will perform 10 revolutions to one of the wheel *a*. Consequently, the velocity of the wheel *c* will be to that of *a*, as 10 to 1; and the final velocity will remain the same.

From this it will be seen, that the power of the intermediate wheels will consist of the final velocity, compounded with the relative proportions of the first wheel and the last pinion.

Thus we see that in Fig. 16, the velocity of the pinion *f*, is to the velocity of the wheel *a*, as 105 to 1, while their respective proportions are as 1 to 10:

$$\text{therefore } \frac{105 \times 1}{10 \times 1} = 10\frac{1}{2}. \text{ Consequently, the proportions necessary be-}$$

tween a weight and power acting upon *b* and *c*, would be as $10\frac{1}{2}$ to 1. Any other proportions might have been assigned to *a* and *f*, but the same rule answers for all. While on this subject, I may be allowed to notice an error

But $\frac{75600}{720} = 105$. Therefore, as $75600 : 720 :: 105 : 1$. Consequently, the pinion f would revolve 105 times during one revolution of the wheel a ; and if we were to transfer the wheel a to the axis of the pinion f , and suspend a weight from the pinion b , then a power of 1, acting on the circumference of the wheel a , would balance a weight of 105 suspended at b .

Fig. 17.

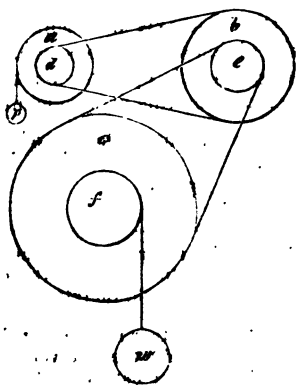


Fig. 17 represents a combination of riggers, connected by means of straps or belts, the first of which passes over a portion of the riggers d and b , while the second passes over portions of e and c .

Let the diameters of a , b , and c , equal respectively 14, 20, and 33, while the respective diameters of d , e , and f , are 6, 10, and 14; then $a \times b \times c = 14 \times 20 \times 33 = 9240$; $d \times e \times f = 6 \times 10 \times 14 = 840$; $\frac{9240}{840} = 11$.

Consequently, the proportion of the quantity of the weight to the quantity of the power, would be as 11 to 1.

The condition of equilibrium is not altered by the relative positions of the riggers to each other, as they might all have been in the same straight line, or forming any angle with each other. The only difference which would arise from changing their directions, would be in the quantity of pressure on their axes; which would be a maximum when the forces acted the same way, and a minimum when they were exerted in opposite directions.

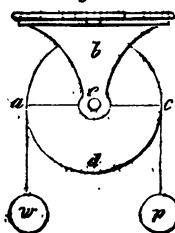
The pulley is the next adaptation of the lever principle, to which our attention will now be directed. Its construction is, I have no doubt, well known. Its component parts are, a wheel of wood or metal fixed on an axis, and having a groove in its periphery to admit

on the subject of ratios of toothed wheels, which is contained in the second treatise on Mechanics, published by the Society for the Diffusion of Useful Knowledge. Article 68 contains a method of preventing the rapid wear of the teeth of pinions, by inserting what is technically called a hunting cog; and they have illustrated this by an example of two wheels, whose numbers of cogs are 10 and 61, and the conclusion at which they have arrived on this case is, that the same two cogs will not come in contact till the larger wheel has revolved 61 times, and the smaller wheel 366: but this conclusion is erroneous, as it is impossible to proportion the wheels in any manner, so that the revolutions of the larger wheel shall exceed the number of cogs in the smaller wheel, before the same teeth come in contact. In the case mentioned above, as the remainder, arising from dividing the larger number of cogs by the smaller, is unity, the fraction is in its lowest terms; and it follows, the revolutions of the larger wheel will be 10, and those of the smaller 61. The reasoning which has led to this false conclusion, may be seen by reference to the work itself.

a cord, by which the power is transmitted; and a frame or support for the axis, which is termed the block.

When several pulleys are combined together, it is called a muffle.

Fig. 18.



PROPOSITION VIII.

In the single fixed pulley, there will be an equilibrium when the power and weight are equal.

For if $a b c d$ (Fig. 18) be a pulley, with a power p , and weight w , suspended from it by means of a cord which passes over the pulley, the force of the weight and power will be exerted at the points a and c , which will then represent the extremities of a lever, whose centre of motion is e ; and as $ec = ea$, there will be an equilibrium when $p = w$.

(To be continued.)

OBSERVATIONS ON THE BOILERS OF STEAM ENGINES.

BY THE EDITOR.

As steam appears to be nothing more than water in a highly rarefied state, produced by the repulsive power of heat insinuating itself between its particles, it follows, that a given quantity of heat can only convert a given quantity of water into steam; no matter under what form of apparatus the heat be applied, provided it be made to enter the water. That boiler is therefore the best for general purposes, in which the least portion of the heat given out by the fuel is wasted; or, (in other words,) that by which the greatest quantity of heat is made subservient to the production of steam. But as a draught of air through the grate to the chimney is necessary to combustion, some loss of heat from this cause appears to be unavoidable; and to reduce this loss to its minimum, ought to be one of the principal objects in the construction of a steam boiler. This object is best attained, by causing as much as possible of the heated air to impinge *upward*, on the under surface of the boiler; as, from the tendency of heat to rise, the *lateral* effect of it is very little, and the *downward* effect still less.

Now, as the heat is to be transmitted *through* the substance of the boiler to the water, it is of essential importance, that the material of which the boiler is constructed should be the best conductor of caloric. For this reason, copper is greatly superior to iron, but the latter generally obtains a preference, on account of its smaller cost: and possibly with some persons, on the ground that iron possesses greater tenacity, or cohesive strength, than copper.

We are, however, disposed to think, that true economy would be best attained by the employment of copper boilers, for several reasons. First, as respects the cost price; the labour of working copper and iron being nearly alike, need not be taken into account;

the difference of cost, therefore, lies only in the relative value of the two metals, the iron being two-pence per pound, and the copper twelve pence. But when an iron boiler is worn out, the old metal is scarcely worth the expence of removal; while the old metal of a copper boiler is worth ten-pence per pound (two-pence per pound being the price charged at the mills for converting old copper into new). Ten-pence per pound being thus returned to the purchaser, the money actually sunk is not more than in the case of the iron.

The experiments of various philosophers have shewn, that iron possesses greater cohesive strength than copper; the average of their calculations (as they vary considerably) will make the difference of strength about one third; but owing to the greater uniformity of the crystalline or fibrous arrangement, and greater freedom from flaws, copper is, to a certain extent, more to be depended upon than iron plates, in the state they are received from the mills. At least, this view of the subject is entertained and acted upon by manufacturers, who uniformly make copper boilers of much *thinner* plates than those of iron, for producing steam of the same pressure. Experience has, we believe, established this as a rule, probably from observing, that when a copper boiler bursts, it only *tears open*, while a wrought-iron boiler is often *blown to pieces*, destroying every thing in its way: this circumstance reduces the first cost of the copper to that of iron.

But the superior conductivity of copper over iron, is also a consideration of importance. Unfortunately, there have been no experiments published of the conducting power of metals, that are sufficiently precise, to afford accurate data to calculate upon; for the experimenters, though they agree as to the greatly superior conductivity of copper over iron, have not furnished any relative numerical comparison of the conducting powers of these, or any of the other metals. Admitting the ascertained fact, it follows, that an iron boiler, of the *same* thickness as a copper one, will require more fuel to produce the same effect, or quantity of steam, in a given time: for it is evident, that a portion of the heated matters that impinge upon the surface of a copper boiler, is not taken up by it; and as the conducting power of iron is less, a greater quantity of the products of the fuel must pass off misapplied, or wasted. Had we the ratio of the conducting powers of the two metals, we should still be unable to estimate precisely their relative practical advantages; for, if the time which elapses between the heated air impinging against the bottom of the boiler, and its entering the chimney, be greater than the time which the caloric would occupy in passing through an iron boiler, it follows, that the effects would not be in the same ratio as the conducting powers of the metals.

The rupturing of vessels exposed to heat, is owing, not unfrequently, to the unequal expansion; and, for that reason, the thicker their substance, the greater their liability to fracture. The thin glass oil flask withstands the heat of an argand lamp, but a thick glass vessel infallibly breaks; this arises from glass being nearly the worst conductor of heat; the heated parts expanding, while the cool

parts do not, a separation takes place. Cast-iron boilers often burst from the same cause. Wrought-iron boilers, being better conductors of heat, are safer than cast-iron; and copper boilers are, for the same reason, preferable to wrought-iron. Our limits prevent us from entering so fully into these points as we could wish, but the advantages of copper boilers over cast-iron are, we think, sufficiently apparent, from the foregoing considerations.

In the construction of boilers generally, the bottom surface should be of sufficient extent, to be capable of absorbing as much heat, as will be necessary to produce the required quantity of steam; what little heat may be given out laterally, serving to prevent condensation in the upper part of the vessel (or vessels); and the smoke, before it passes up the chimney, should be robbed as much as possible of its heat, by being brought into contact with the conduit pipe, by which the boiler is supplied with cold water.

There is a considerable waste of fuel, in producing steam by intensity of heat upon a small surface; the application of a moderate heat (800° Fahr.) upon a large surface, being far more economical. A cubic foot of water converted into steam per hour, has been reckoned as equivalent to one horse's power: and Mr. Watt has observed, that this quantity of steam could be raised per hour by eight feet of surface of boiler, in a judiciously constructed furnace. In practice, it is usual to allow from four to five feet of bottom surface of boiler, to raise one cubic foot of steam per hour.

It is considered essential, that a boiler should contain four or five times as much water as it boils off per hour; and it is obvious, that it should have a space above the water, capable of containing as much steam as will supply the engine at each stroke, without materially diminishing its elastic force; for this purpose, the steam room should hold a volume equal to the supply of eight or ten strokes of the engine.

In large engines it is usual to employ two, three, or more boilers, to supply them with steam; one of them being reserved for use, in case of repairs being required to the others. In fact, a spare boiler should be provided, wherever stoppages are of serious importance in a concern: for this reason there are two boilers (Gurney's tubular) to only a ten-horse engine at the London Portable Gas Works, the boilers being used alternately.

Boilers should have an excess of strength, equal to three times the pressure on the safety-valve for high pressures; and for low pressures something less will be sufficient.

There are many other circumstances to be taken into consideration in the construction of boilers, which the inquisitive reader will find very ably treated, in Mr. Tredgold's recent work on the steam-engine: and as our confined limits will not permit us to extend this paper further, we conclude by observing, that much of the strength of a boiler depends upon its form. In the preceding pages of this work, almost every variety of form, hitherto devised and acted upon, have been described. For the convenience of our new subscribers,

we annex the following list of contrivances, which every person connected with this department of art ought to be acquainted with.

Vol.	Page.	Vol.	Page.
1 Perkins's, ...	370	3 De Cans' & Branca's, 237, 238	
2 Smith's, ...	89	Blakey's, ...	348
Horton's, ...	146	Leupold's, ...	234
M'Curdy's, ...	178	4 M'Curdy's, ...	1
Barton's, ...	194	Oliver Evans's, ...	302
Chapman's, ...	226	Robertson's, ...	314
3 Hall's, ...	49	Woolf's, ...	335
Rd. Evans's, ...	1	James's, ...	354
Paul's, ...	69	Perkins's, ...	451
Bellingham's, ...	84	Poole's, ...	457
Alban's, ...	114	Christie's, ...	484
Mandslay & Field's, ...	132	2, N. S. Gurney's, ...	20
Wadsworth's, ...	158	— Long's, ...	120
Moore's, ...	223	— Steenstrup's, ...	256
Thompson & Burr's, ...	233	— Scott's, ...	352
L. H.'s, ...	339	3 — Tippett's, ...	82

LIST OF PATENTS

Expired in the Month of December, 1828.

BARRELS, &c.—To Robert Dickenson, of Great Queen Street, for improvements in barrels and other packages. Dated December 10, 1814.

MOVEMENTS.—To Robert Salmon, of Woburn, Bedfordshire, for improved combinations of wheels for working cranes, mills, &c. Dated December 10, 1814.

DRAWING BOLTS, &c.—To Edward Glover, of Penton Place, Welworth, for an apparatus for extracting bolts, nails, &c. Dated December 10, 1814.

CONFECTIONARY.—To H. J. Winkler, of Dover, Confectioner, for a method of giving effect to various operating processes. Dated December 12, 1814.

WOOL-CARDS.—To Joseph C. Dyer, of Boston, America, and Gloucester Place, Camden Town, for improved machinery for manufacturing cards for carding wool, silk, &c. Dated December 18, 1814.

BRICKS.—To J. F. Wyatt, of Farnival's Inn, for a new kind of bricks or blocks, for building purposes. Dated December 18, 1814.

SOAP.—To William E. Baron Von Doornick, of Sun Street, Bishopsgate, for improvements in making soap. Dated December 20, 1814.

SASH FASTENING.—To James Smith, of Newark upon Trent, Nottingham, for a self-acting sash fastening. Dated December 20, 1814.

SHIP'S BUOYS.—To Robert Dickenson, of Great Queen Street, for improvements in the ship's run-buoy and haup-buoy. Dated December 20, 1814.

BREWERS' VATS.—To John Vallance, jun. of Brighton, for an apparatus and method of so constructing and securing brewers' vats from falling to pieces, &c. Dated December 20, 1814.

PRINTING.—To Frederick Koenig, of Castle Street, Finsbury Square, for further improvements in his printing machinery. Dated December 24, 1814.

THIEVES' ALARUM.—To E. Jordan, and W. Cooke, of Norwich, for an apparatus for detection of depredators, which they denominate *The Thieves' Alarum*. Dated December 24, 1814.

CANDLES.—To John White, of New Compton Street, Soho, for a method of making candles. Dated December 27, 1814.

TO OUR READERS AND CORRESPONDENTS.

The Communication of C. S. is intended for our next number.

ERRATA.—In consequence of the indisposition of the Editor, several errors of the press escaped uncorrected in the last number. The following occurred in *Mr. Whipple's* Letter, which in justice to that gentleman we hasten to correct.

- page 70, line 6, for *restrain* read *vostrum*.
- .. 24, for *perfectability* read *perfectuability*.
- .. 37, for *barbarian* read *barbarick*.
- .. 50, for *I would* read *he would*.
- .. 59, for *Phipple* read *Whipple*.

In Captain Low's Letter, page 78, line 43, for *appears* read *applies*.

Fig. 1.

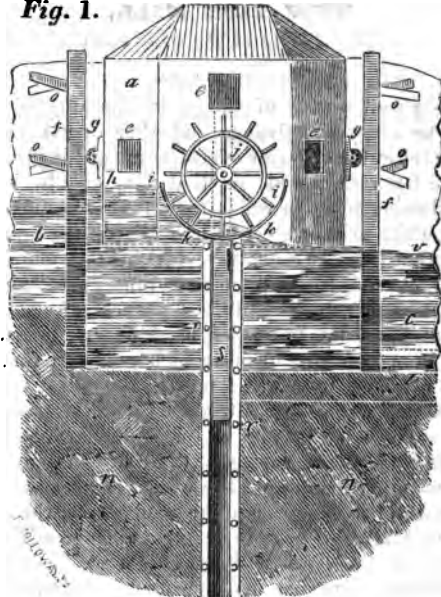
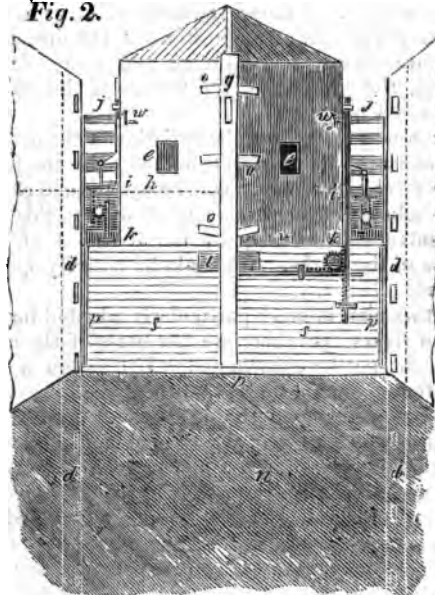


Fig. 2.



**PLAN FOR MAKING USE OF THE RISE AND FALL
OF THE TIDES TO PROPEL MACHINERY,
IN HARBOURS, RIVERS, AND ON THE SEA COAST.**

NEW TIDE MILL,
[Represented on the other side.]

TO THE EDITOR.

SIR,—Being well aware of the great liberality with which you give publicity to every contrivance, whether or not you may agree with the projector in the superior effectiveness of his plans over others that may have been proposed, or that may now be in practice, I submit the following plan, in which the object is to make use of those natural means which may conduce to immediate force; and be applied to produce motion in those machines, which the scientific abilities of the present day have introduced so numerous into this country.

The present plan is designed for the purpose of making use of the rise and fall of the tides to propel machinery. The water is compelled to flow in and out of a basin in such a manner that the greatest force shall be obtained from its current.

The annexed diagrams are introduced to illustrate the following explanation. Fig. 1 represents a perpendicular projection of the principal parts on a plane, supposed to be drawn longitudinally and vertically through the centre of the work. *h v* show the respective heights of the water on each side of the flood gate *s*; the flushes *i* on *d*'s side, and *k* on *c*'s, are supposed to be open, and according to the nomination of the parts the water is flowing from the basin into the sea.

Fig. 2 represents a perpendicular projection of the principal parts on a plane supposed to be drawn latitudinally and vertically through the centre of the work. *h* shows the level of the water when flowing from the represented side; the position of the flushes under these circumstances are shown, *i* being open and *k* closed: *v* shows the level vice versâ, the position of the flushes in this case are seen, *i* being closed, and *k* open.

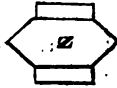
An objection may arise from the variation of the quantity of water at the spring and neap tides. To counteract this the flush *i* is introduced into the flood gate *s*, which may be opened and closed according as there is a redundancy or deficiency of water; this may either be effected by centrifugal balls, or by the attention of the individual who takes care of the works. It should be entirely opened when the mill is not used.

Although this plan is more particularly adapted for harbours and the tide-way of rivers, yet there are few parts of the coast on which such a mill might not be constructed. If it be on a sandy beach a large wooden tunnel should be laid down at the lowest tide level, in order to introduce water upon the flood-gate. The basin had better be constructed of wood, as then the sides of it may be vertical, which is of great advantage to produce a less variable current; but it may be excavated, and lined with clay, which should be covered over with shingle, in order to prevent the clay from being washed off.

If it be on a rocky coast, and as before exposed to a surf, there should be a small tunnel excavated, (as shown by dotted lines at *t*). The basin in this case is easily formed; I conjecture that an excavation of the capacity of one of our first-rate ships, and about 12 feet

deep, would contain water enough to turn two pair of stoncs for a grist mill.

a a is the floating mill, of which the form of a ground plan is as fig. 2. It has angular ends for two reasons; 1st, because the building



may be more easily constructed in this manner, to bear the pressure on the sheaves *g g*: and 2ndly, in order to give a proper direction to the water. *b* is the excavated basin; *c* the sea or harbour; *n* the soil; *e* the flood-gate attached to the mill, and moving up and down with the tide; *j* the water wheel; *i i* flushes for introducing water on the wheel; *k k* ditto, for letting it off; *l* ditto, for regulating the influx of water according to the strength of the tide; *d* the channel cut in the sides of the wall, and sunk below low water mark, according to the rise and fall of the tide above; into which are inserted small sheaves working on an iron plate placed on the floodgate, in order to reduce the friction. *f f* are vertical beams of timber, supported by pieces *s o*, thrown across the passage horizontally and diagonally, with respect to the beam itself; for the purpose of bearing the horizontal pressure of the building on the sheaves *g g*, which pressure takes place on each beam alternately, with the rise and fall of the tide; *e e* are doors, the upper one may receive the corn or materials when the mill is at a proper level, and the lower one discharge the same when in a convenient situation; leather is placed in the joints, in such a manner as to prevent the water from getting through between the slide and flood-gate.

N.B. There are two wheels; this is in order that the pressure on the grooves *d d* may be less partial.

Cambridge, 18 Dec. 1828.

I am, &c. &c.

C. S.

PATENT BOILER FURNACE,

By JAMES GILBERTSON, of Hertford.—Dated January 15, 1828.

This invention is expressed in the title to be "an improvement in the construction of furnaces, by which they consume their own smoke," and it is calculated to effect that important object rather better than many of its predecessors; the novelty of its arrangements are, however, so slight, as barely to support the claim of patent-right. In most of the preceding contrivances for this purpose, a current of heated air is admitted at the back of the furnace, which causes the smoke ascending from the fire to be returned into the ignited fuel, by which it is wholly or partially consumed. The air thus introduced to the back of the furnace is in some cases heated by passing through the grate bars, which are made hollow for that purpose, (as in Chapman's, vol. ii. first series, p. 226): in others, by being made first to traverse the ash pit (as in Gregson's, vol. ii. new series, p. 154.) Mr. Gilbertson's (the present patentee's) method is certainly an improvement upon these; he has (to use his own expression) "hollow plates" of iron at the sides of the furnace, through which a current of air passes into a cavity at the back of the fire, whence passing through a grating above the cavity it comes in contact with the smoke,

and causes it to ignite. From the great conductivity of the iron plates at the sides of the furnace, and the increased area of the cavities formed between them, beyond those of the hollow furnace bars of Chapman, there must, we think, be a more plentiful supply of air (or oxygen) at a high temperature, than by the other modes mentioned; and for this reason we conceive that Mr. Gilbertson's furnace deserves the preference over that class of inventions which are designed to burn their own smoke by returning it into the fire.

IMPORTANT IMPROVEMENTS IN DYEING.

IN our account of the articles exhibited at the National Repository (vol. ii. N. S. page 264) we made the following remarks upon No. 278. "*A specimen of a new and improved black dye, in a rich black silk manufactured in Spitalfields. If it be true, as asserted, that tea, wine, or the strongest acetic acid may be applied to this silk, without in the slightest degree affecting its colour, or injuring its appearance, the discovery is indeed one of great value.*" At that time we could not vouch for the fact ourselves, but a friend has put it into our power to demonstrate the truth of it by experiment, and we have proved that this excellent dye is not only capable of withstanding the action of vegetable acids, but the mineral also, and of caustic alkalies, when only so much diluted as to prevent the destruction of the fibres of the silk. We have therefore the satisfaction of congratulating the public upon a very great improvement in this interesting branch of art; which has been introduced into this country by an intelligent young foreigner, who, we sincerely hope, will meet with an adequate reward for so useful a discovery. We understand that he is now engaged in executing some work on trial for a dye house in Spitalfields, and that he is in possession of several other valuable secrets in dyeing, which are the fruits of his study and ingenuity.

His process of dyeing is very important in another point of view, for in addition to the circumstance of producing a permanent blue black, the process has the effect of considerably *increasing the weight, attenuating the thread, and augmenting its bulk.* The texture of the silk is at the same time rendered proof against the corrosive action of acids, which act destructively on every species of goods dyed in the ordinary mode. A very small portion of the colouring matter appears to be soluble in the vegetable or mineral acids even by long affusion, and the dyed silk when thus treated had a harsh and wiry feel, totally different from that of ordinary silk, which was rendered a pulpy mass by the same treatment.

In our experiments we were kindly assisted by Mr. Hemming, the Lecturer on Chemistry: they were 56 in number, and are exhibited under a tabular arrangement in the annexed page. The first portion describes the effects of eight different tests upon four samples of silk dyed by the improved process. The second portion shows the effects of five of the same tests (as were applied to the former) upon five different samples of silk procured by the Editor, dyed by the ordinary process.

BY THE NEW PROCESS OF DYEING.

	Spun Silk, dyed black, increased thereby in weight 25 per cent.	Spun Silk, dyed black, increased thereby in weight 10 per cent.	Spun Silk, dyed black, increased thereby in weight 125 per cent.	White Silk, prepared to receive various colours, inc. 50 per cent.
Concentrated sulphuric acid, diluted with 2 parts water.	A small portion of the colour discharged, shown by the reddening of the acid; the colour of silk not altered, nor texture injured.	Acid reddened, but the colour and texture uninjured.	The acid more deeply coloured; but the colour of the silk unaltered, and texture uninjured.	Colour of silk not at all affected.
Strong nitric acid, diluted with 3 parts water.	Acid coloured, and the colour of silk deteriorated.	Colour of silk not affected; but reduced in bulk, or shrank.	Acid coloured, but colour of silk very slightly affected.	Not affected.
Strong muriatic acid, not diluted.	Acid coloured, colour and texture of silk uninjured.	Colour of silk not affected, but texture injured.	Acid coloured; colour of silk and texture uninjured.	Not affected.
Oxalic acid, a saturated solution.	Colour of silk not at all affected, texture slightly so.	Colour not at all affected, nor the texture.	Colour not at all affected; texture very slightly.	Not affected.
Citric acid (fresh lemon juice).	Acid not coloured, and silk quite unaffected.	No effect upon the colour or texture of silk.	No effect upon the colour or texture of silk.	Not affected.
Boiling vinegar.	Colour not affected, nor texture.	Not in the least affected.	Not in the least affected.	Colour deteriorated.
Boiling muriatic.	Turned to a blue.	Colour affected, and texture destroyed.	Colour affected, and the texture destroyed.	Not tried.
Cautic potash, a strong solution.	Solution coloured—the black colour of silk very intense,—texture uninjured.	Solution more deeply coloured; the colour of the silk slightly deteriorated.	The colour of the silk slightly affected.	The colour deteriorated.

BY THE ORDINARY PROCESS OF DYEING.

	Spun Silk, dyed black.	Pieces of Black Silk Handkerchief.	Pieces of new Blue Silk Ribbon.	Linen Cloth dyed black.	Woolen Cloth dyed black.
Concentrated sulphuric acid, diluted with 2 parts water.	Colour entirely discharged.	Colour entirely discharged.	Colour not affected.	Instantly affected.	Instantly affected.
Strong nitric acid, diluted with 3 parts water.	Colour entirely discharged.	Colour discharged.	Colour discharged.	Instantly affected.	Instantly affected.
Strong muriatic acid not diluted.	Colour discharged, and the silk reduced to a pulp.	Colour entirely discharged.	Texture destroyed, colour changed.	Instantly affected.	Instantly affected.
Oxalic acid, a saturated solution.	Colour instantly discharged.	Colour instantly discharged.	Neither colour nor texture of silk affected.	Instantly affected.	Instantly affected.
Citric acid (fresh lemon juice).	Colour quickly discharged.	Not affected.	Not affected.	Instantly affected.	Unaltered.

All the specimens of silk thus experimented upon are preserved, and are in the care of Mr. Hemming, and may be viewed on application, through the Editor of this work.

PATENT SHOT CARTRIDGES FOR SPORTSMEN,

By JOSHUA JENOUR, of Brighton Street, St. Pancras.—Dated Nov. 28, 1827.

THIS patent is for the application of an old contrivance to a new object, namely, that of destroying the feathered class of bipeds by means of grape shot instead of our own; the patentee has therefore rather developed his "organ of destructiveness," (as a phrenologist would say) than that of "constructiveness." The latter quality has usually been considered as a necessary appendage to the head of a patentee, but as it must be admitted that the precedents are very numerous wherein the royal protection has been extended to developments of the former, we will not quarrel with the title of the patent, but proceed to describe the thing; which the reader will presently comprehend by recalling to his mind those pretty bunches of iron balls inclosed in net-work, which are employed as cannonized arguments against the unruly and unfaithful. The virtue of such great balls being, however, chiefly confined to exterminating or mangling the human form divine, Mr. Jenour proposes to manufacture grape shot of a diminutive species; for slaughtering the inhabitants of the air, having found by experiment that the shot thus collected into a cluster will "spoil their singing" much more effectually than if allowed to disperse, as usual, immediately after leaving the chamber of death.

The small lead shot are inclosed in a net-work of fine brass wire, and the interstices between the shot filled with bone dust; it is then put into a cylindrical paper case or cartridge, so as to occupy about half its length, and the remaining space is filled with gunpowder; by these means the sportsman is saved the trouble and inconvenience of charging from a powder flask, and he can triumph over a greater number of killed and wounded.

A learned authority has somewhere stated, that a patent, to be valid, must be for *making something that is useful*; it might therefore be argued, how can destroying birds be *making* any thing?—to which we reply, that killing live birds is *making* dead birds, and dead birds *make* good dinners, and that good dinners are *useful* every body will admit: therefore, here is a "making of something that is useful," and the patent is good in every sense of the word.

BITUMINOUS VAPOUR ENGINE.

SIR,—While I am ready to admit that the Register of Arts contains more information on the construction of power engines than any of its contemporaries, I have been somewhat disappointed in not meeting with any description of De Montgery's engine, which has been the subject of much conversation here. The only notice of it in the periodical press was in the *Annales de l'Industrie*; where it is stated that it derives its power from the vapour of purified bitumen, which having operated upon the piston, is conducted to the furnace, and used as a combustible for the production of fresh vapour. The furnace, and the

principal part of the machinery, are contained within the generating apparatus, which has a double case. In consequence of this arrangement, it is added, that vapour of a high degree of elasticity is obtained free from danger, and the bulk of the whole machine *is only a 50th part of a steam engine of equal power*. If you can favour your readers with a description of this curious machine, with a drawing, in your peculiar intelligible way, it will no doubt please them, and much oblige your obedient Servant,

RICHARD BARLOW.

Rowen, 19th December, 1828.

[Our information on this subject does not extend beyond our Correspondent's, and from not having seen or heard any thing of the matter for 3 or 4 years past, we are inclined to think it was merely one of those evanescent meteor-like schemes, which blaze for a while in the brains of the inexperienced mechanic, and then vanish for ever.]—Ed.

PRIZE ESSAY ON THE LEVER. THEORETICAL AND PRACTICAL.

By G. G. WARD, Machine Maker.

(Continued from p. 98.)

PROPOSITION IX.

In the single moveable pulley there will be an equilibrium, when the power is to the weight as 1 : 2.

Fig. 19.

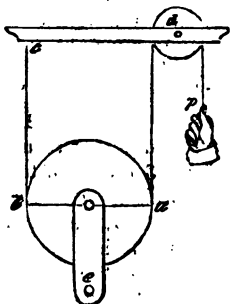
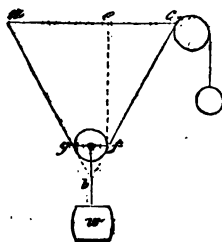


Fig. 20.



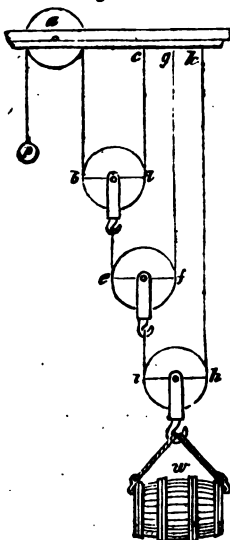
For the pulley ab (Fig. 19) is obviously reducible to a lever of the second order, whose fulcrum or fixed point is at c ; and the power p will be transmitted by means of the fixed pulley d , to the point b ; and as the point e , on which the weight acts, is equally distant from a and b , which represent the fulcrum and point of action of the power of the lever ab , it follows, there will be an equilibrium when $w : p :: ab : ae$; but as $ab = 2ae$, it is $w = 2p$, or $p = \frac{1}{2}w$.

If the direction in which the cords act are not parallel, a new mode of investigation becomes necessary, as the case is then analogous to that of oblique forces in Prop. II. For if the angle abc (Fig. 20) be formed by the cords which support the weight w , it is evident a power applied at c would resolve itself into two forces, one acting in the direction of the line ac , the other in the direction of the line ec ; and if gf be considered as a lever, the same reasoning applies as was used in Prop. II.; and we shall have the perpendicular action of the force cf , on the lever gf , equal to ecf , which is the cosine of the angle efc . Consequently, a part of the force equal to ec , the sine of the same angle, is exerted in the

direction ac ; and, as a precisely similar effect takes place on the opposite side of the lever gf , it follows, that the power must be to the weight, as the line fc is to twice the line ef ; that is, as radius

to twice the cosine of the angle formed by the directions of the power and resistance.

Fig. 21.

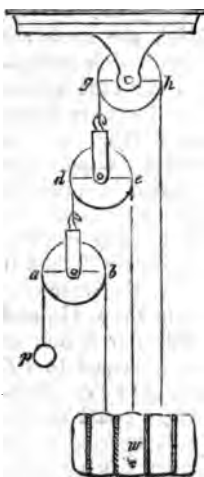


In the system of pulleys represented by Fig. 21, the power is to the weight as 1 to 2, raised to that power whose index is the number of moveable pulleys, which, in this case, is 3; therefore we have $2 \times 2 \times 2 = 8$, the proportion of the weight to the power.

And if we suppose these to represent levers of the second kind, the result will be precisely the same. For the fixed pulley *a*, affords no mechanical advantage, as its arms are equal: but a power acting at *p* is transmitted by pulley *a* to the point *b* of the pulley *b*, which may then be considered as a lever, whose fulcrum is the point of suspension *c*. Consequently, a power of 1 acting at *p*, would sustain a weight of 2 at *e*, which weight of 2 acts upon the point *f* of the lever *ef*, whose point of suspension is *g*; it will therefore sustain a weight of 4 at the point *h* of the lever *hi*, whose fulcrum is *k*. But *hi* being also a lever of the second order, it follows, that a weight of 4 at the point *h*, would sustain a weight of 8 at *w*. Or, (by Prop. IV.) $\frac{bl}{2} \times \frac{ef}{2} \times \frac{hi}{2} = 8$.

By reversing the position of the system represented by Fig. 21, and attaching the cords to the weight as in Fig. 22, a different result will be produced; for we have 3 levers of the first kind, acting upon the weight *w*. Let

Fig. 22.



the first of these three levers, *ab*, be acted upon by a power *p*, equal to 1; it is evident, that as the arms on each side of the centre of motion are equal, a power of 1 at *p*, would sustain a part of the weight *w* equal to 1; and there would then be a force of 2, acting at the extremity *d* of the lever *de*. Consequently, this force of 2, would sustain a portion of the weight equal to 2; and we have then a force of 4 operating on the point *g* of the lever *gh*, which would sustain a portion of the weight equal to 4 times *p*; so that the whole amount of efficacy resulting from this combination will be $1^p \times 2^p \times 4^p = 7^p$. Therefore, a power of 1 at *p*, would sustain a weight of 7 at *w*. It will be seen from this, that the power is to the weight as 1 to 2, raised to that power, whose index is the number of separate cords acting upon the weight diminished by unity; as $2 \times 2 \times 2 = 8 - 1 = 7$.

Fig. 23.

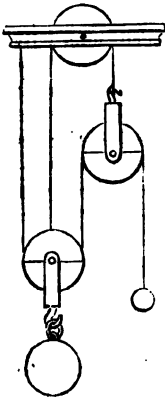


Fig. 23 represents a combination of pulleys where *a* is a fixed, and *b* and *c* moveable pulleys.

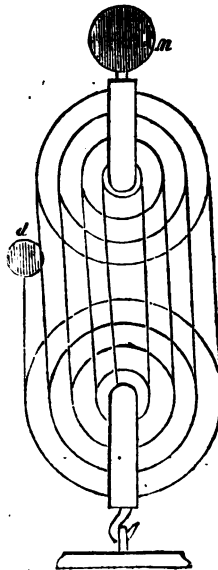
In this arrangement, the power is to the weight as 1 to 4. For *b* is a lever of the second order, whose fulcrum, or point of suspension is *c*. Consequently, a weight of 2 would be sustained at *b*, by a power of 1 acting at *p*; but the pulley *c*, by which the efficacy of *p* is transmitted, is also moveable; and as *p* will sustain as much of the weight as is equal to its own quantity, there will be a force of 2 acting at the centre of the pulley *c*; and as this force of 2 acts in opposition to the weight, by means of the fixed pulley or equal armed lever *a*, it follows, that it will sustain a quantity of that weight equal to 2. Therefore, the whole quantity of energy exerted by the power *p*, through the medium of the pulleys *a*, *b*, and *c*, is equal to 4 times the quantity of the power.

Fig. 24 represents an ingenious arrangement of the pulley principle, the most compact and useful, perhaps, that has yet been invented. It consists of a number of concentric grooves, whose respective diameters are regulated by the quantity of cord which must pass over their peripheries in equal spaces of time.

In this system and all others where a single cord is employed, the power is to the weight as 1 to the number of parts of the cord acting on the lower block, or as 1 to twice the number of pulleys in the lower block, and as in the system shown by Fig. 24, the number of cords or parts of the cord which sustain the lower block is 8, it follows the power *p*, equal to 1, will sustain a weight *w*, equal to 8. The analogy of this system to the lever principle will be seen by comparing it with the foregoing examples; which examples I have chosen because they differ from each other materially in their modes of action, and appear to me to be the simples from which all other systems are compounded.*

Having thus endeavoured to develop the principles upon which the lever depends, in its most simple form, and in its modifications,

Fig. 24.



* I have been, perhaps, more tedious than interesting on this subject, but this has arisen from a desire to set the subject in as clear a point of view as possible, to which I have been prompted by observing, that although all writers on the subject have asserted that the pulley is of the lever class, they have not endeavoured to render it so apparent as the nature of the relation admits.

as the wheel and axle, and the pulley; it remains for me to execute the second part of this task, by a description of some of the various applications of this important engine; and as these descriptions will be given in most cases from my own observation and experience, they will be of necessity drawn from very familiar sources, and the only excuse I can plead for introducing some of them is, that however plain and simple they may appear, I have often met with individuals who though constantly in the habit of taking advantage of their results, were totally unacquainted with their principles, utterly ignorant of the laws by which they were governed.

APPLICATIONS OF THE LEVER.

ONE of the most general and useful applications of the lever is to the purpose of determining the weights of bodies according to a given standard.

Its form is in most cases that of a lever of the first kind, with equal arms, consequently, will remain in equilibrium when equal weights are suspended from its extremities.

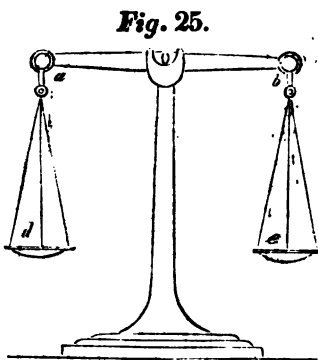


Fig. 25.

Fig. 25 represents an instrument of this kind, which is termed a balance, whose component parts are *a b*, the lever or beam *c*, the fulcrum on which the beam rests, and *d e* the dishes or scales in which the substances whose proportions we wish to ascertain are placed. If the space between *a* and *b* were considered as a mathematical right line, and this theory could be carried into practice, the construction of the balance would be easy of accomplishment; but this not being the case, it is of importance to understand what are the requisites to enable it

to perform its office as perfectly as possible, and they will be found to be as follows. 1st, That it rests in no other position than a perfectly horizontal one, when loaded with equal weights.

To effect this, it is necessary that the arms of the balance be precisely equal in length, and that the centre of gravity of the bi-conical mass *a b* should be below the fulcrum or point of suspension *c*; for if the centre of gravity of the beam was above the point on which it rests, the least deviation of the beam from the horizontal position would cause it to descend on that side to which it was inclined, and it would continue to descend till its centre of gravity was immediately below the point of support. Also, if the centre of gravity of the beam was coincident with its point of support, it is evident, from the principles of the centre of gravity, that in this case the beam,

when loaded with equal weights, would remain quiescent in any position which might be given to it, consequently, would be totally useless where the equilibrium is to be denoted by the horizontal position of the beam; therefore the proper position of the centre of motion *c* is immediately above the centre of gravity of the beam *a b*.

The second qualification is, that it possess great sensibility, or that the equilibrium be disturbed by the smallest quantity of weight which may be placed in either scale; this will depend on the arms of the beam being made as long as convenient: for the greater the distance of the weight from the centre of motion, the greater will be its momentum, consequently, the greater will be the sensibility of the balance.

Its sensibility depends, also, upon the distance between the centres of gravity and suspension of the beam; as the sensibility will be greatest when those two centres coincide.

3rd, it should possess considerable stability, or should quickly resume the horizontal position when disturbed. This also depends on the distance between the two centres of gravity and suspension, as the stability will be the greater as this distance increases.

By an attentive consideration of these three requisites the situations of the various parts may be easily discovered, and the most perfect construction will be when the centre of gravity of the beam is immediately below the centre of suspension, and the centres of suspension of the weights in the same right line with the centre of gravity of the beam.

The common balance with equal arms is not the only application of the lever to the purpose of ascertaining the weights of bodies. It is sometimes constructed with unequal arms, to the shorter of which the substance to be weighed is affixed, while a shifting weight is moved along the longer arm, till an equilibrium is established.

Fig. 26.

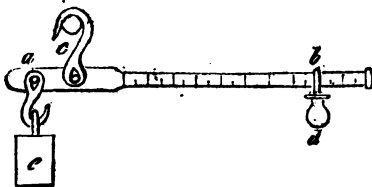


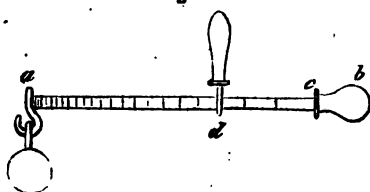
Fig. 26 represents an instrument of this kind, and it is evident from what has been established of the principles of the lever, that there will be an equilibrium, when $a c \times e$ equals $b c \times d$; therefore the weight *d* will be contained as many times in the weight of *e* as the distance *a c* is contained

in the distance *c b*. Consequently, if the arm *c b* be graduated so as each of its divisions equals *a c*, and if the quantity of *d* be known, we have then the means of ascertaining the precise proportion which a substance at *e* bears to the weight *d*, by observing the number of the division immediately over *d*, when an equilibrium takes place, and these proportions may be ascertained to almost any degree of exactness by accurate subdivision of each of the parts 1, 2, 3, &c.

Fig. 27 represents another application of the lever to the purpose of weighing; but in this example the standard weight is fixed at one extremity of the lever, and the substance to be weighed is attached

to the other end, while the fulcrum is moveable. If ab were a

Fig. 27.



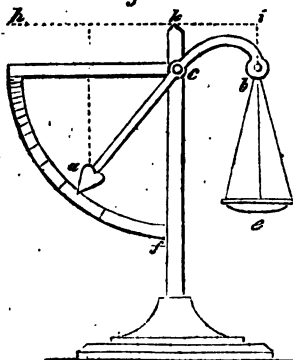
mathematical right line, the graduations from b to a would require to be equal, and the difference of their number on each side of the fulcrum would denote the proportions between the substance to be weighed and the standard weight, but as this is not the case in practice, a different arrangement becomes necessary; for if c be the centre of gravity of the beam when not loaded, and we apply a weight at a , it becomes necessary to remove the fulcrum or point of suspension d to a part of the beam between a and c , and this distance will be greater as the weight is increased. Suppose the fulcrum moved from c to d , we have then not only the increased leverage of bd to take into account, but also the increased weight of the arm dc , which must be added to the increased leverage bd .

It were not very difficult to point out the method of graduating this instrument mathematically, but, as however great the accuracy we might use, it would still be impossible to apply it in practice, I shall omit it in this place.

The best method of graduating this instrument is by applying known quantities at the point a , and marking the place of the fulcrum d , when an equilibrium takes place.

The bent lever is sometimes rendered available as a weighing instrument, as may be seen by reference to Fig. 28, where ab is the

Fig. 28.



lever and c its fulcrum; the substances to be weighed are to be placed in a dish e , and the longer arm of the lever to which a weight is attached, rises along the arch fg , and denotes the quantity of the substance by the graduation at which it rests. As the efficacy of the weight a is constantly increasing as it rises along the quadrant fg , it follows that the divisions on that arch, to indicate equal additions of weight, will constantly occupy lesser portions of its outline, the nearer they approach the point g . That this is true may be ascertained by viewing it in another light; for if we consider hi to represent a lever whose fulcrum is k , and a and e to represent a power and weight acting on that lever, it will be seen that the efficacy of this lever will be shown by the perpendiculars drawn from the points a and b on to its horizontal arms hk and ki , and it is evident that, as the weight

a approaches the point c the effect of the arm $h k$ will increase, while that of $k i$ will constantly diminish.*

One of the most frequent applications of the lever, in its most simple form, is that of the crow-bar, which is generally used to elevate a heavy mass to a small height, as in Fig. 29, where a represents the

Fig. 29.

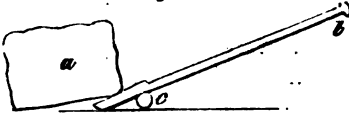
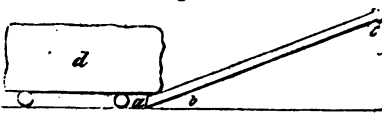


Fig. 30.



mass to be raised, b the lever, and c any object which may serve as a fulcrum; in this case the bar acts as a lever of the first kind, therefore its efficacy would be measured by the difference of the lengths of the arms from the object c .

But it as often serves as a lever of the second order, as in Fig. 30, where the surface over which the mass d is to be rolled serves as a support for the lever. In

this case the advantage gained is the difference of the distances $a c$ and $a b$.

Levers of the second order are frequently applied in the formation of the safety valve of high-pressure steam engines, (although it is to be feared that their object has in many cases been defeated) so as to regulate the quantity of force required.

Fig. 31.

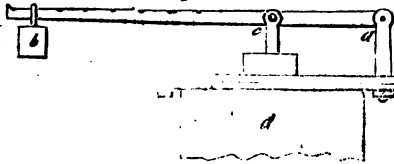


Fig. 31 represents a lever thus applied; a being the fulcrum, b the weight, and c the acting force, which arises from the elasticity of the steam in the upper part of the boiler d , and it is evident that the further the weight b is removed from the fulcrum a , the greater

will be the force required at c to elevate the weight at b , and the removal of b , or adding to its quantity may be carried to such an extent as to hazard the destruction of the engine; for if the material of which the boiler was composed was capable of sustaining a force of 60 lbs. on each square inch of its surface; and if the area of the safety valve contained 9 square inches, there would then be a pressure of 540 lbs. acting on the point c of the lever ab ; and if ac were 6 inches, and ab 36 inches, then a weight of 90 lbs., applied at the

* There is an error in the Prize Essay of last year, where it treats of this subject, which I was rather astonished to meet with, as the slightest acquaintance with the action of perpendicular forces (gravity to wit) on obliquely situated levers must be sufficient to demonstrate the erroneousness of the conclusion which is there stated. I allude to that part which states that the index of the bent lever balance should be divided into equal parts.

point *b*, would exactly counterbalance the effects of the force at *c*. For $6 \times 540 = 36 \times 90$. But if the weight were removed to a greater distance from *a*, the resistance at *c* to the increased elasticity of the steam would be greater than the attraction of cohesion at any other part of the boiler which would consequently be destroyed.

(To be concluded in our next.)

MISCELLANEOUS INTELLIGENCE.

ULRIC'S CHRONOMETER.—Some important improvements have lately been effected in time-keepers, by a German of the name of Ulric, who has succeeded in reducing to practice several theoretical improvements, which had hitherto defied the skill of our best artists. In the patent marine time-keeper we are now describing, the irregularity, arising from inequality in the power exerted by the main-spring, is prevented, by the transfer of the motive power to a spring lever; which, capable of receiving only a certain portion of power from the spring, can only impinge on the balance axis with a certain and determinate force. This force, invariably the same, will, of course, always impel with the same effect. To secure an isochronous motion, the spiral or pendulum spring is made perfectly taper, an object obtained only through the medium of an elaborate tool, constructed for the express purpose of reducing them to this form. The variation between the sea and the land rates, in the best chronometers hitherto constructed, is remedied by the introduction of a balance, without iron or steel, consequently free from magnetic properties, or influence, yet possessing a compensating power, considerably more sensitive, and more active than any previously used, without any liability to permanent distortion of its true figure, by any transition from one temperature to another. The imperfection technically called *tripping*, and which is so frequently the cause of much error and mis-calculation, is entirely prevented; nothing short of a violence sufficient to destroy the machinery of the time-piece, can cause it to trip. They admit of being cleaned without disturbing their rates, and, indeed, without disturbing those parts on which the accuracy of their movements depend; a quality which every one, who has the use or care of chronometers, will be able to appreciate. The most inexperienced person may safely be entrusted to wind them up, no change of position being necessary, and no possibility of over-winding or winding wrong existing. An increased solidity is introduced into every part, diminishing almost to annihilation the risk of accident by any ordinary occurrence, and consequently, removing one very fruitful source of anxiety to the navigator.—*New Monthly Mag.*

NEW VEGETABLE ROUGE.—Mr. Holman, the blind traveller, states, in his narrative of a residence at Fernando Po, that one of the native women went to a tree whose leaves and berries resembled those of our laurel, and plucking off about a dozen of the younger

leaves made them up into a bundle, which she then first dipped into water, and afterwards into wood ashes. They were then ground into pulp on a stone, the surface of which formed an inclined plane, from which the material was allowed to run off when sufficiently prepared. On rubbing a portion of this pulp on our hands and faces it became after drying a most beautiful and delicate rose colour, which required several times washing with soap and water before it could be removed, and which, if allowed to remain without washing, would retain its brilliancy for a comparatively long time. Mr. Cowen professed his intention of sending a quantity of this dye to his fair friends in England.

VEGETABLE ORIGIN OF SILK.—The parenchyma of the white mulberry is composed of a tissue of beautiful white fibres of silk, much resembling China silk, which would lead us to the inference that silk is a vegetable, not an animal product, that is to say, that the basis of the material, in its proximate form, is derived from the vegetable kingdom, though the spinning of its substance into a lengthened thread is entirely due to the mechanical functions of the silkworm. The silk tissue of the mulberry becomes very obvious by breaking some decayed twigs of two or three years' growth.—*Gard. Mag.*

NATURAL STOCKING WITH FISH OF PONDS ON HILLS.—The large water-beetle, which is in the habit of feeding upon the spawn of fish, occasionally in the evening climbs up the stems of rushes, &c., out of the water, sufficiently high to enable it to take wing; in these circumstances it has been caught, and, putting it into water, has been found to give out the spawn with which it had gorged itself previous to taking flight, both in a digested and undigested state,—so that on trial, it has been found that it produced fish of various kinds.—*Edin. New Phil. Journ.*

MEDICINAL QUALITIES OF THE VIOLET.—The medicinal qualities of the violet order lie in the roots, which contain, in all the varieties, in a greater or less degree, emetic properties. One of the ipecacuanhas is the root of a Brazilian violet.—*Magazine of Natural History.*

PRODUCTION OF COTTON.—Cotton is furnished by the fibrous threads in which the seeds of the gossypium of the order of malvaceæ, are enveloped.—These threads, when examined by the microscope, will be seen to be finely toothed, which explains the cause of their adhering together with greater facility than those of bombax and several apocynæ, which are destitute of teeth, and which cannot be spun into thread without an admixture of cotton.—*Ib.*

COMET OF 1811.—According to the recent calculations of the Professor Lambert, of the University of Dorpat, the comet so long visible in the year 1811 was 571 times smaller than the sun, but 17 times bigger than Jupiter, 25,104 times bigger than our globe, 1,255,000 times bigger than the moon, while its orbit exceeds that of all the planets of our solar system put together.—*Leipziger Literatur Zeitung.*

LIST OF NEW PATENTS SEALED.

EVAPORATION.—To William G. Kneller, of Great Pearl Street, for improvements in evaporating sugar and other solutions. Dated 27th November. Six months.

STEAM ENGINES.—To Joseph D'Arcy, of Leicester Square, for improvements in steam engines. 29th November. Eighteen months.

DISTILLATION.—To Edward Dakin Phillip, of Regent Street, for an improved distilling and rectifying apparatus. 29th November. Six months.

DISTILLATION.—To Robert Stein, of Regent Street, for improvements in distillation. 4th December. Six months.

SPECIFIC GRAVITY.—To William Brunton, of Lombard Street, for an apparatus to ascertain and register the specific gravity and temperature of fluids in transit, &c. 4th December. Six months.

MEDICINE.—To Philip Derbyshire, of Ely-Place, Holborn, for an embrocation to prevent or alleviate sea-sickness; also applicable to other maladies. 4th December. Six months.

CARRIAGES.—To Zb. Riley, of Union Street, Southwark, for an apparatus applicable to carriages, to afford safety in travelling. 10th December. Four months.

STEAM-ENGINES.—To Geo. Rennoldson, of South Shields, for improvements in rotary steam engines. 4th December. Two months.

SUGAR REFINING.—To John Hague, of Cable Street, Wellclose Square, for an improved method of expelling the molasses from sugar. 6th December. Two months.

PROJECTILES.—To Isaac Dickson, of Chester Street, Grosvenor Place, for an improved projectile. 8th December. Two months.

SWEEPING MACHINES.—To John Boase, of Albany Street, and Thomas Smith, of Augustus Street, Regent's Park, for improved machines for sweeping, scraping, watering roads, &c. 10th December. Two months.

LACE.—To Thomas Lawes, Strand, for an improvement in the manufacture of bobbin-net lace. 10th December. Six months.

PROPELLING.—To Charles Cummrow, of Laurence Pountney Lane, for improvements in propelling vessels. 10th December. Six months.

MUSIC BOOKS.—To Abram Lewis, of Birmingham, for a mechanical *volta subito*, to assist musicians in turning over quickly the leaves of music books whilst playing. 10th December. Two months.

HATS AND CAPS.—To T. W. C. Moore, of Hampstead, (late of New York, U. S.) for a combination of machinery for manufacturing hats or caps. 10th December. Six months.

INSTANTANEOUS LIGHT.—To Samuel Jones, Strand, for an improved method of procuring instantaneous light. 10th December. Two months.

BITS.—To Valentine Llanos, of Hampstead, "for improvements in bits." 15th December. Six months.

BURNING SMOKE.—To John Forbes, of Cheltenham, for a new method of burning smoke. 15th December. Six months.

MOTIVE POWER.—To R. Williams, of Tabernacle Walk, for improvements in the application of elastic and dense fluids to the propelling of machinery. 15th December. Six months.

PROPELLING VESSELS.—To Anton Bernhard, of Finsbury Circus, for improvements in the wheels or apparatus for propelling vessels. 15th December. Six months.

CARTRIDGES.—To John D. Whitehead, of Saddleworth, York, for improvements in making cartridges, for sporting and other purposes. 15th December. Six months.

BLEACHERS' RETORTS.—To John Morritt, of Corkridge, near Leeds, for improvements in retorts used by bleachers and makers of oxymuriate of lime. 15th December. Two months.

AXLETREES.—To John Slater, of Birmingham, for improvements in axletrees and boxes for carriage wheels. 15th December. Six months.

LACE.—To John Levers, of Nottingham, for improvements in machinery for making bobbin net lace. 18th December. Six months.

PROPELLING VESSELS.—To William Stead, of Gilderton, and James Stead, of Doncaster, Yorkshire, for improved paddle-wheels. 18th December. Two months.

WOOLLEN CLOTH.—To J. and J. Charlesworth, and S. A. Mellor, of Holford, for improved machinery for raising and finishing woollen cloth. 18th December. Two months.

APPAREL.—To James Sinister, of Birmingham, for the preparation of a new kind of cloth, and the application of it in the making of stays and other articles of dress. 18th December. Six months.

CARRIAGES.—To Edward Joseph, of Haydon Square, for improvements in the wheels and axletrees of carriages. 18th December. Six months.

"TILL."—To Francis Horatio Nelson Drake, of Colyton House, Devon, for "being in possession of the process for the invention of a peculiar till." 18th December. Four months.

TO OUR READERS AND CORRESPONDENTS.

In our article on Steam Engine Boilers, contained in our 54th number, we accidentally omitted the following five in our list; viz. Franklin's, vol. 2, p. 249; Isaac's, vol. 2, p. 371; Eve's, vol. 4, p. 33; Porter and Co.'s, vol. 2, N. S., pp. 267, 283; Frazer's, vol. 3, N. S., p. 49.

Mr. Hancock's favour is received, and intended for our next.

A description of the piston mentioned by TIFTON MECHANIC will be inserted, as soon as the means alluded to are afforded to us.

R. S. and Mr. KNOX's favours are received.

ADULTERATION OF BREAD.—We have received an answer to the animadversions of Mr. Whipple on the paper of I. H. G. on this subject, which we are obliged to defer till our next.



**HANCOCK'S AQUATIC DRESS FOR WALKING
ACROSS DEEP RIVERS.**

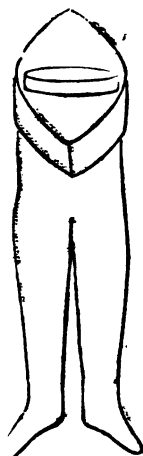
TO THE EDITOR.

SIR,—I have for some time past entertained an idea that a very light and simple apparatus might be made to enable persons to cross the widest rivers with perfect security and ease; and, if necessary, to carry with them their travelling necessities. I should probably have made the experiment during the last summer, had not business detained me so long in Paris, that on my return I had not time; and although I am not aware that such a contrivance is likely to be extensively useful, yet I have thought that it may be so in situations with which I am unacquainted. At all events, if you think it worthy a place in your very useful publication, it may be the means of ascertaining the fact. The motive for giving it publicity is not, I fear, quite so disinterested as may at first appear, inasmuch as I am recommending an apparatus which can scarcely be formed of any other material than that in the manufacture of which I have been for some years engaged.*

I propose to have a dress made, to draw on over the clothes like a pair of trowsers, but to reach as high as the arms, and to inclose

* Mr. Hancock is the manufacturer of the indian-rubber water-proof cloths, and the pneumatic beds, pillows, cushions, &c. sold by Messrs. Macintosh & Co. 46, Cheapside, and 58, Charing Cross.—ED.

the feet; this dress must be made so as to perfectly exclude the water. Round a little below the top part of the dress, I propose to have a flexible case to contain a sufficient quantity of air to float the weight of the person, his wallet, and as much water as the dress would hold with the person in it, that in case of its filling by any accident he may still float:† a small paddle for each hand completes the whole. I conceive that the plan is so obvious, that with the assistance of the annexed drawing, it will at once be perfectly understood. I should make the air-chamber in the form of a boat, as I think it would then steer by means of the paddles with great facility, and the cavity fore and aft would be the proper place to stow the luggage. I think it would be practicable to attach a pair of paddle wheels, but this would destroy the chief feature of its usefulness, viz. its portability. With such an outfit, a traveller when he comes to a river, or a farmer, when the "waters are out" wishes to visit a friend, has only to draw on the dress, and apply his mouth to the aperture of the air-chamber, and he is presently in a condition to walk across the river or over the water, wherever he pleases; and on reaching his destination, he has only to evacuate the air from the chamber, draw off his boat, &c. and resume his journey, or receive the congratulations of his friend. The kind of transport hitherto described would be suitable for summer only, but if necessary the dress may be made double, so as to form a cavity capable of containing a thin stratum of air, which being a bad conductor of heat, would, I presume, protect the wearer in a great measure from the cold even in winter. As any degree of muscular action may be exerted in working the paddles, either in making great speed or performing a variety of evolutions, would it not form a new kind of aquatic recreation and amusement? What think you, Mr. Editor, of a game at trap-ball by half-a-dozen skilful players with a pneumatic ball?—or a shooting or fishing party walking the "watery deep"? I fear, however, that I have already taken too great a scope for my boat; and too much space in your valuable columns.



I am, Sir, your obedient Servant,

London, Dec. 23, 1828.

THOMAS HANCOCK.

N.B. The cut in the margin is a representation of the aquatic dress separately.

PATENT MODE OF PROPELLING VESSELS.

By THOMAS TIPPETT, of Gwentnap.—Dated October 9, 1828.

THE patentee's proposition is to fix horizontally in a vessel below the water line a long cylinder, one end of which is open, and passes

† I do not consider this at all likely to happen, or the weight of the water may be got rid of by lifting up each leg and turning a small cock near the heel, thereby opening a communication with the water without.

through the stern of the vessel; but packed or caulked so as to prevent any leakage of the water between the external side of the cylinder and the surrounding wood work. The cylinder is to contain a piston, which being alternately withdrawn slowly towards the stem, and projected rapidly towards the stern, admits the water to enter the cylinder and be forced out again, and by the effect of the latter action to propel the vessel. To aid the propulsion, the patentee further proposes to fix long horizontal rods in such a manner that they shall move similarly to the piston rods; and to the farthest extremity of these rods, projecting beyond the stern of the vessel, are attached flaps or wings, jointed so as to open or expand breadthwise when they are projected against the water, and to close or contract edgewise, on being drawn back towards the vessel. The power to work the piston, &c. is to be derived from the patentee's patent engine, described by us at page 81, in the present volume.

The patentee does not furnish any details of his method of connecting the piston rods with the engine so as to effect *the alternate slow and quick motion* which he mentions: and as the means of performing it are not very obvious to us, we shall be obliged by the patentee explaining them.

PATENT PROCESS IN PREPARING RAW SUGAR.

By WILLIAM FAWCETT, of Liverpool, and M. CLARK, of Jamaica.

Dated December 4, 1827.

This invention consists in the construction of an apparatus for the manufacture of sugar from the cane, in which steam at a high pressure is first applied to a series of sugar pans, for evaporating and concentrating the saccharine fluid to the consistency at which it crystallizes; the steam having parted with only a portion of its caloric to the sugar, is afterwards conducted to a steam engine, and employed in actuating it.

The specification and drawings describe a series of five sugar pans, arranged side by side in the form of a letter T, and set over a boiler; each of these five pans is surrounded by a jacket or case, for the steam to envelope them. The furnace is formed of large tubes, *within* the boiler, after the manner of Trevithick's, and the fire from thence passes under two other pans, without cases, before it enters the chimney. The two last-mentioned pans are therefore operated upon by heated air, instead of steam, in order that the remaining caloric may be abstracted from the smoke, &c. before passing up the chimney. There are thus seven pans in all, five being worked by steam, and two by heated air. The boiler is provided with safety valves, stop-cocks, floats, steam pipes, and other necessary appendages to the foregoing: one pipe leads to the engine, which works the crubbing mill, and another returns the condensed hot water into the engine. Upon the whole the combination exhibits a good practical apparatus for the preparation of raw sugar from the cane, without possessing any very striking feature of novelty in its arrangements.

ON SAFETY VALVES,

With a Suggestion for the Security of Boilers against Explosion.

By the EDITOR.

It would be needless to expatiate on the importance of safety valves to the steam engine, since the term itself conveys to the mind not only their importance but their necessity. The invention was first introduced by Dr. Papin, in 1694, as an appendage to his apparatus for dissolving bones by steam at a high pressure; but to Savery is due the merit of first applying it to the steam engine. It afterwards received some improvement in its form, by Beighton; since which time (1718) the apparatus has remained unaltered in its form, and its denomination, the *steelyard safety valve*, (which it received in consequence of its resemblance to the ancient weighing machine) remains the same.

Safety valves are popularly considered as only applied to give vent to the steam when its force becomes *too great* for the strength of the boiler to sustain without the risk of bursting; but there is another kind of safety valves of precisely the reverse description, which provide for the safety of the boiler, if the pressure in it should become *too little* to support the pressure of the atmosphere, in which case the boiler would be crushed. The latter are called by engineers *internal safety valves*, in contra-distinction to those of the usual description, termed *external safety valves*. The internal being, however, only used in very large, and consequently comparatively weak boilers, are seldom required; we shall therefore briefly state, that they usually consist of an inverted conical plug, kept in its seat by a lever, loaded with a weight, which will be counterbalanced by the pressure of the atmosphere, when the latter exceeds by three or four pounds per superficial inch, the pressure of the steam in the boiler.

Of the external safety valves, the *steelyard* form of Papin and Beighton is almost universal; it has been frequently introduced in the description of boilers, in the former pages of this work, and was inserted in our last number, page 109, in Mr. Ward's Essay on the Lever, we shall therefore merely make a few remarks on the regulations which ought to be observed in its use.

The valve should be always kept inclosed in a box, with a pipe leading to the chimney to carry off the steam that escapes; the box should be kept locked, and the key in the proprietor's charge, in order that the loading of the valve should not be placed at the discretion of an ignorant or injudicious attendant; numerous dreadful accidents have occurred from the mismanagement of the safety valve, and it has been reported that some explosions have originated by persons maliciously overloading the safety valve.

It is not uncommon in low-pressure boilers to place the whole load directly upon the valve, instead of increasing the force of the weight by leverage: and it is unquestionably the safest arrangement wherever valves are exposed to the interference of improper persons; but it is better in all cases to inclose them. The load per inch on the valve should only just exceed the force of steam per inch required to

work the engine; and the orifice opened should in all cases be so large as to permit the steam to escape faster than it can be generated.

Fusible metal plugs have been proposed as an additional precaution to the use of safety valves. The suggestion originated with Trevithick, who had holes drilled in the sides of his high-pressure cylindrical boilers just below the water line, in which the plugs were inserted; so that, should the water from any accidental circumstance sink below its proper level, and endanger the explosion of the boiler by the sides becoming intensely heated, the plugs would melt and allow the steam and explosive gases to escape. They have also been recommended to be put into the bottoms of the boilers, in order that if the boiler should become dry, the plug should fuse, and the fire be put out by the discharge of the steam into the furnace.

Some manufacturers introduce two safety valves to a boiler, one of them loaded with a less weight than the other, in order to give timely notice of the excess of pressure, as well as with the view of increasing the security, should one of the valves owing to corrosion stick in its seat, or fail to act properly from any other cause.

The mercurial guage is another great security to a boiler, as it always indicates the exact pressure, and should the force of the steam increase beyond the range of the guage, or so as to endanger the security of the boiler, the mercury is forced out of the tube into a vessel placed to receive it, and the steam escapes up the tube into the atmosphere. An important advantage might be taken of the discharge of the mercury to stop the engine and secure the safety of the boiler. We would suggest that the receiver of the mercury be suspended to the power end of a long lever of the first class, whose other end (near to the fulcrum) might be made to lift a safety valve from its seat, loaded with a weight greater than that which ejected the column of mercury from the tube. By this arrangement the valve would be kept open until matters were arranged, and security to the person and the machinery would be instantly afforded. Or the depression of the lever might be made to ring a bell to call attention to the circumstance; or be made to damp the fire, by shutting off the supply of air; or by various means be made to check the too rapid generation of steam.

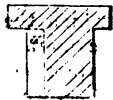
Mr. Tredgold observes in his *Treatise on the Steam Engine*, that it would be an improvement upon safety valves if they were so constructed as to be relieved of a part of their load when raised from their seat, but he has omitted to give a plan. One of the simplest ways of effecting this object would be to convert the straight lever of the steelyard valve into a *bent lever*.

Instead of the conical plugs usually employed in safety valves, Mr. Woolfe has introduced into most of his engine-boilers, plugs of a cylindrical form, as represented in the margin by fig. 1, which is a plan, and fig. 2, which is a vertical section. The cylinder, which has three semi-circular longitudinal grooves *a a a*,—fits easily into an aperture in the top of the boiler, and the steam, which fills the grooves,

Fig. 1.



Fig. 2.



pressing against the under surface of the head, raises the plug, and allows the steam to escape. The plug is loaded either by a weight suspended to it inside the boiler, by weights laid directly upon the top, or by the agency of a loaded lever.

Several new forms of safety valves have been described in the former pages of this work;—see vol. iv. first series, pp. 37 and 341; vol. iii. 278; &c.

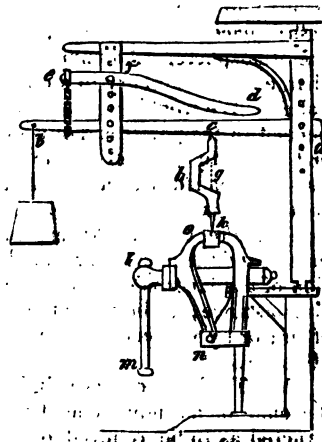
PRIZE ESSAY ON THE LEVER. THEORETICAL AND PRACTICAL.

By G. G. WARD, Machine Maker.

(Continued from p. 110.)

Some of the tools in general use amongst mechanics, afford examples of the application of the lever. The apparatus termed a press drill, consists of a lever of the second and a lever of the first kind combined; as in Fig. 32, where ab is a lever of the second kind, whose fulcrum is a , the weight being applied at b , whose efficacy is transmitted to the point c . Consequently, if ab be 6 feet, and ac be 2 feet, a weight of 100 lbs. suspended from b , would exert a force of 300 lbs. at c ; but as it is necessary that the pressure should be frequently released from c , the lever de is added, whose fulcrum is f ; the extremity of the shorter arm is connected to the lever ab by any convenient method; and when the workman wishes to release the brace g , he applies his power at the extremity of the longer arm; and, by pulling downward at d , the shorter arm is raised, carrying with it the lever ab ; consequently, the brace g is at liberty to be removed. Suppose the arm ef of the lever de to be 9 inches, and the arm df to be 36 inches, and that the shorter arm was connected with the lever ab at the distance of 12 inches from b , it is plain, from the nature of the lever ab , that a weight of 100 lbs. suspended at b , would exert an influence at c equal to 180 lbs.; and as df is equal to 4 times ef , it would require a force equal to 30 lbs. to be applied at d , in order to raise the lever ab from the point a . When this apparatus is in use, there is another example of the lever

Fig. 32



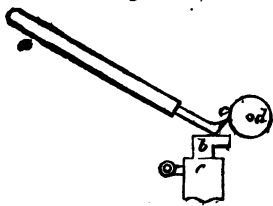
added to it, whose form is that of the brace *g*; the longer arm or point, where the power is applied, being the distance from the centre line *g*, to the centre of the part *h*, and the resistance acts on the semi-diameter of the tool *h*; and if this be $\frac{1}{4}$ of an inch, and the distance from *g* to the centre of *h* be 7 inches, a force of 90 lbs. acting at *h*, would be equal to a resistance of 560 lbs. at *h*. It is also necessary, that the object to be operated on should be firmly fixed in its position; and for this purpose an instrument termed a vice is used, which is compounded of a lever of the third kind, a lever of the first kind, and an inclined plane or screw. The handle *lm* is clearly a lever of the first kind; and if the efficacy of the screw were alone equal to 10, its radius being equal to $1\frac{1}{2}$ in., and if the effective length of the lever *lm* were 20, it follows there would then be $\frac{80}{5} = 16$. Consequently, a power of 20 lbs. applied at *m*, would

transmit a force equal to 320 lbs. through the axis of the screw. But as *no* is a lever of the third kind, whose fulcrum is *e*, and the power applied at the centre *p* of the screw, we have as *no* : *np* :: 320 to the resistance it would overcome at *o*; for if *no* be 24 inches, and *np* 18 inches, it is as 24 : 18 :: 320 : 240, which is the quantity of force acting at *o*, by a power of 90 applied at *l*. An example of the banded lever is seen in the tool called a claw

Fig. 33. hammer, as represented by Fig. 38; *ab* being the longer arm, to which the power is applied, while the resistance acts at *a*. The shorter arm of this lever will be represented by the distance of the part on which it rests from the point *a*, which will depend on the position in which the lever is placed; for, as the part of the lever *cd* is an arch of a circle, the fulcrum will be continually changing from *c* to *d*; and the nearer the fulcrum approaches to the point *c*, the greater will be the efficacy of the lever; which will constantly diminish, till the point *d* becomes the fulcrum of the lever.



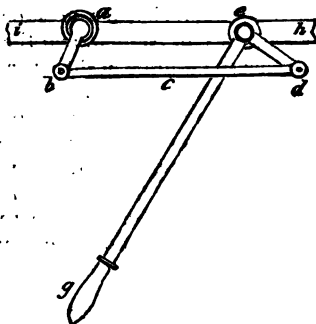
Fig. 34.



The generality of tools used in turning iron, are angular levers, the shorter arm being formed as an inclined plane or wedge. Fig. 34 represents a tool of this kind; *ab* being the longer arm, *bc* the shorter arm, *d* the substance to be operated upon, and *e* the rest to support the tool. As the workman applies his power on the arm *ab*, it is evident he has two methods of increasing the effi-

cacy of the lever, or rendering it capable of overcoming a greater resistance, either by increasing the length of the handle *ab*, or inclining it more to an horizontal line; the last of which has the advantage of placing the shorter arm *bc* in a more favourable position for cutting the substance in the lathe.

Fig. 35.



Some beautiful examples of the application of levers, are to be met with in the construction of printing presses. Fig. 35 represents a system of levers, as applied in the Stanhope press. The object to be attained by this combination is, to impart motion to the screw which carries the platen, by a power applied at the extremity of the handle *g*. To effect this, a lever *ab* is fixed on the top of the screw, whose shorter arm would be the radius of the

screw; its longer arm the distance from the centre of the screw to the point *b*; this, by means of a connecting rod *c*, acts upon the lever *deg*, whose fulcrum is *e*; and as, by this combination, the platen acts through but a small space, in comparison to the space passed through by the power, it follows, that the efficacy of such a system would be considerable. But it is necessary that this efficacy should be a maximum when the platen impinges upon the type, and this object is accomplished by the angular position of the levers: for when the platen is elevated, the lever *eg* is parallel to the line *hi*, and its shorter arm *ed*, is nearly perpendicular to the same line, and also to the connecting rod *c*; therefore will move the rod *c* with its greatest velocity during the first part of the motion of the lever *eg*; at which time the lever *ab* forms an acute angle with the line *hi*; consequently acts at a disadvantage in causing the revolution of the screw; but by the time the lever *eg* is brought perpendicular to the line *hi*, (at which time the platen impinges on the type,) the lever *ab* is also perpendicular to the connecting rod *c*; consequently it will then exert its greatest influence in causing the revolution of the screw; and at this time also the power of the workman will be applied at right angles to the lever *eg*, therefore will produce the greatest effect precisely at the moment of impact.

Fig. 36.

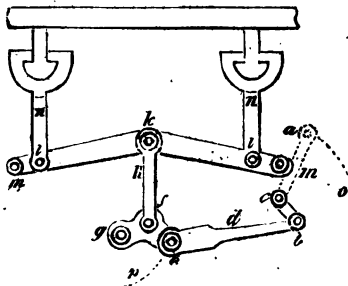
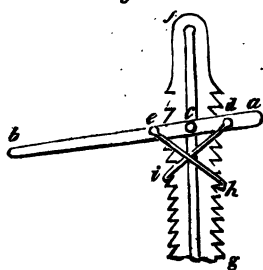


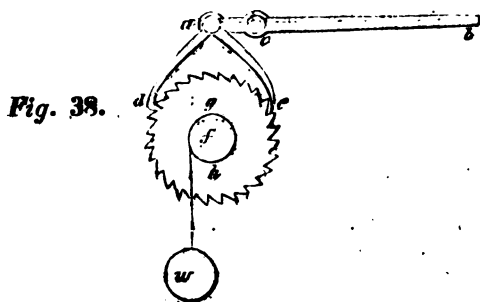
Fig. 36 exhibits another ingenious arrangement of levers for depressing the platen, as used in the Ruthven printing press. acb is an angular lever, whose longer arm ac is in the form of a winch, to which the workman applies his power; while the shorter arm cb acts upon the extremity of the connecting rod d , by which its efficacy is transmitted to the point e of the lever efg , whose fulcrum is g : this lever is connected, by means of the rod h , to the extremities of the levers $k lm$, whose fulcra are mm . The rods nn are connected with the levers $k lm$ at ll , while their upper ends act upon the supports of the platen, by means of a species of hooks. Now, if the lever or winch ac , be turned in the direction of the dotted line ao , the shorter arm cb , will push the rod d in the direction be . Consequently, the point e of the lever efg , will move in the direction of the dotted line ep ; and as the point f will describe a similar arch, the rod h will depress the ends k of the levers $k lm$. Consequently the rods nn will be drawn down, bringing with them the platen. The same regulation with regard to the angular positions of the levers, is observed in this arrangement, as in the Stanhope; so that their greatest efficacy is exerted at the moment of impact.

Fig. 37.



Levers are sometimes so arranged, as to produce a continued rectilinear or circular motion. Fig. 37 is a contrivance to effect the first of these purposes. It consists of a lever ab , whose centre of motion is c ; two hooks are fixed at the points $d e$, which work into the notches of the beam fg , which is free to move in a longitudinal direction. Now, if the end b of the lever ab be raised, the hook $e h$ will also be raised, in the ratio of its distance from the centre of motion c , carrying with it the beam fg ; and on depressing the end b of the lever, the hook $d i$, being on the opposite side of the fulcrum, will be elevated, and the beam will again be raised: so that the lever ab acts both in its upward and downward motions; being a lever of the second order during the first part of the operation, and a lever of the first kind in the latter part of its action. It will be seen, that this instrument admits of various modifications; as the power may be applied at both extremities of the lever ab , or the points d and e may be at different distances from the centre of motion; so that they might act upon an unequal number of notches, and thus produce different velocities in the motion of the beam.

Fig. 38 is a representation of what is, in general, termed the perpetual lever. It is very similar in its arrangement to the former figure; ab being the lever, whose fulcrum is c ; but that which was the beam in Fig. 37, is, in this example, exchanged for the ratchet wheel $d e$, which revolves on its axis f , carrying with it the axis $g h$, to which the weight is appended. The extremity a of the lever ab is furnished with two hooks, working on a common centre; their lower ends act upon a wheel at d and e . As this machine consists



of a lever of the first kind, and a wheel and axle, its efficacy may be easily ascertained. For if bc be equal to 12, and ac equal to 2, and if the radius of the wheel equals 6, and the radius of the axle equals 2, we have $\frac{12}{2} \times \frac{6}{2} = 18$. Or thus, $\frac{12 \times 6}{2 \times 2} = 18$. Consequently, (leaving the oblique action of the hooks out of the question,) a power of 1, applied at the point b of the lever ab , would sustain a weight of 18 at w .*

There is a useful arrangement of levers for producing rotatory motion, to be met with in a machine which is used for cutting chaff. Fig. 39 represents this arrangement; a being a pin, which traverses in the groove ab , on the end of which pin the lever cd , whose fulcrum is d , is supported, ef is a connecting rod, whose upper end

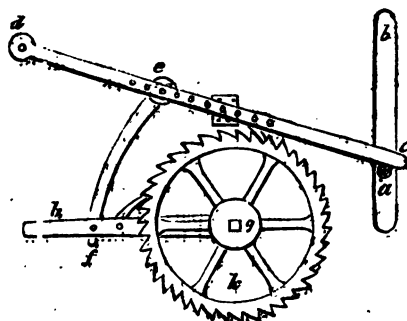


Fig. 39.

* It will be seen on reference to that part of the Prize Essay of last year, where the efficacy of this machine is discussed, that the results deduced are erroneous, and this error appears to have arisen from the author's adopting that corollary, the erroneousness of which I have endeavoured to shew at p. 17 of this Essay. As I conceive the object of all scientific investigation to be the discovery of truth, I have made no scruple to point out the errors I may have discovered, and sincerely hope that others would perform the same friendly office towards myself, and thus mutual correction will produce mutual instruction; error will be detected and truth substituted in its place, which cannot but produce a general benefit to all parties concerned.

e, works on a pin, which passes through the lever *c d*, and the lower end *f* is attached to a lever *g h*, whose fulcrum is *g*. This lever is furnished with a hook at *f*, which works in the ratchets of the wheel *k*, on the same axis with which is the roller to which motion is intended to be given. Now, if the pin *a* be raised, it will lift the end *c* of the lever *c d*, which, by means of the connecting rod *e f*, will elevate the lever *g h*, and raise the hook *f*, carrying with it the wheel *k* in a circular direction. The velocity of *k* may be adjusted by shifting the rod *e f* to different distances from the fulcrum of the lever *c d*, which is furnished with holes for that purpose. The hook *f* is merely to prevent the recoil of the wheel *k*. It will be seen, that during the descent of the pin *a*, no motion is imparted to the wheel *k*; which is the very object to be attained, as it prevents the substance to be cut from coming forward, while the knife is cutting that part of it which was thrust forward, during the former part of a revolution of the wheel *k*.

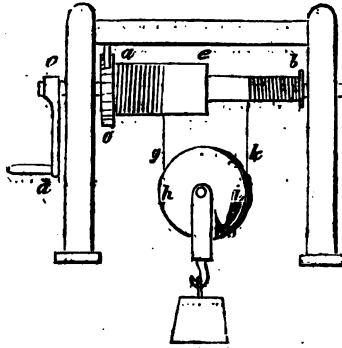


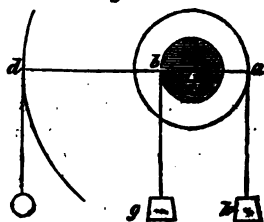
Fig. 40.

Fig. 40 represents a modification of the wheel and axle, which, for simplicity of construction, and immense power, far surpasses any other machine, which is applied to purposes for which this is adapted: and, however its modest unassuming appearance may prevent its admission into the elegant companies of wheels and pinions, which we see associated together in this age of mechanical combination, there can be but little doubt, that it will eventually work its way into notice by its own merits; to the displacing some of those complicated arrangements of wood, iron, and brass, which, in some cases, seem to be erected for no other purpose, than employing a horse to do the work of a man; and in others, vice versa. The construction of this machine will be readily understood by reference to Fig. 40. *a b* is a windlass, which is worked by a winch or handle *c d*. It will be seen that the windlass *a b* partakes of two diameters; that part from *a* to *e* being larger than the remaining part *e b*; the cord *g* is wound round the part *a e* of the windlass, and is passed under the moveable pulley *h i*, and is carried over the part of the windlass *a b* on the opposite side, to that from which it

descended at a e : the weight to be raised is suspended from the pulley h i . Now, if a power be applied at d , and the windlass be caused to make one revolution, a portion of the cord g , equal to the circumference of the part a e of the windlass, will have been wound on to the windlass ; but the part e b of the windlass has also made one revolution : consequently, a portion of cord equal to the circumference of e b has descended : so that, after one revolution, the cord will have been shortened a quantity, equal to the difference between the larger and smaller circumferences of the windlass ; but as this difference has been divided between the two parts of the cord g and h , it follows (from what has been premised of the pulley) that the weight has been raised through a space equal to half the difference of the circumference of a e and e b . But, as circles are to each other as their radii, the following simple rule may be deduced.—As a c d , the radius of the winch, is to half the difference of the radii of the parts of the windlass a e and e b , so is the weight w , to the power which is necessary to produce an equilibrium.

For example, let c d equal 18, the radius of a e equal 6, and the radius of e b equal 3 ; and suspend a weight of 108 lbs. from h i : we then have $6 - 3 \div 2 = 1\frac{1}{2}$; and as $18 : 1\frac{1}{2} :: 108 : 9$. Consequently, a power of 9 applied at the point d , would be equivalent to a weight of 108 acting upon the pulley h i . This subject may be perhaps better understood, by referring to Fig. 41, where a e represents the radius of the larger part of the windlass, and b e the smaller radius, e d being the radius of the winch ; and we may then suppose d a to represent a lever, whose fulcrum is e ; and as each of the ropes g h (Fig. 40) bear equal parts of the weight w (Fig. 40) of 108 lbs., we

Fig. 41.



represent the whole weight by two distinct weights g and h , (Fig. 41) acting upon the points b and a of the lever d a ; and if we retain the proportions of Fig. 40, (namely, d e 18, a e 6, and b e 3,) we have a weight h on one side of the fulcrum, at the distance of 6, whose quantity is 54 ; and we have a power of 54 acting at the distance of 3 on the opposite side of the fulcrum. Now it will easily be seen from the principles of the lever, that g will sustain a quantity equal to $\frac{1}{2}h$; consequently, there will remain a weight of 27 acting at a , to be kept in equilibrium by a force applied at d : but e d is 3 times e a : therefore, a power equal to 9 applied at d , would balance a weight of 27 acting at a ; which is precisely the same result as was obtained by the rule before laid down.

Although the diameter of the pulley h i (Fig. 40) does not affect the mechanical efficacy of the machine, yet, in practice, a certain rule must be observed in its proportions ; which will be regulated by the circumference or the larger part of the windlass, and the circumference of the smaller part, together with the number of revolutions they will require, to raise the weight to its greatest elevation.

For example, let the larger circumference be 36 inches, the smaller 18 inches, the greatest elevation required in the weight 90 feet : now, by reference to what is written in elucidation of Fig. 40, it will be seen, that it will require 27 revolutions of the windlass, to raise the weight to a height of 90 feet ; therefore it is necessary that the length of ae , Fig. 40, should be equal to 27 diameters of the cord used to raise the weight ; and, as the weight, when at its lowest point, will act upon the part a of the larger barrel, and the part e of the smaller barrel, it follows, that the diameter of the pulley hi , will also require to be equal to 27 diameters of the rope.

But if we wish to maintain perfect parallelism in the cords, there is another circumstance to be attended to ; for it is obvious, that as the ropes by which the pulley (hi , Fig. 40) is suspended, act at considerable distances from the centres of motion, and on opposite sides of those centres, that the pulley will occupy an oblique position, with regard to a vertical plane passing through the axis of the windlass. So that a line, representing the diameter of the pulley, would be the hypotenuse of a triangle, whose base would be equal to the number of revolutions of cord required on the larger barrel, multiplied by the cord's diameter, and its perpendicular, equal to the diameter of the larger barrel, minus half the difference between the larger and smaller diameters of the barrels. This will be seen on reference to Fig. 42 ; where ab represents the larger barrel, c d

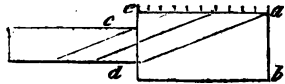


Fig. 42.

the smaller, and ae the number of revolutions of the cord ; and if a line be drawn from a to d , it will give the length of the diameter of the pulley. As the parallel position of the cords is maintained through the whole time of ascent or descent, any other points might have been taken in ae , Fig. 42, if the same proportions were observed. It is necessary that this machine be furnished with a ratchet wheel* for a catch to act into, (as at o , Fig. 40,) to prevent

* In that most excellent work, Gregory's *Mechanics*, the following passage will be met with in the description of this machine at page 3, vol. ii. :—"This windlass has likewise the peculiar property of holding the weight at any part of its rise or fall without needing a ratchet wheel and catch." If such were the case, it would, indeed, be a peculiar property ; but such is not the case, as will be seen by reference to Fig. 41, where I have reduced it to a lever with a power and weights acting on its arms ; and we there found that it required a power of 9 lbs. to produce an equilibrium, consequently, if that power were withdrawn the equilibrium would be destroyed, and the weight would descend with an increasing velocity. As the work I have quoted is one of authority on subjects of machinery, and as the error I have pointed out has been copied from thence into Nicholson's *Operative Mechanic* (I believe) and likewise into the *Library of Useful Knowledge*, it will be seen that it has been long and widely circulated ; and although it may appear of little importance it is not so in reality ; for if any person had constructed such a machine on the principles there laid down, without making provision for a ratchet wheel and catch, additional expense and trouble would have been incurred to add them to the machine, at a future period.

mischief, in case of an intermission of the power by inadvertence or otherwise.

I have thus endeavoured, in that manner which to me did seem most fit and proper, to investigate the properties and applications of that important engine, the lever; how I have succeeded in this task remains to be decided. If I should be the victor in this honourable struggle, 'tis well; if I am defeated by more able competitors, 'tis well also: for it will convince me, that others in my own station of life, are endeavouring to emancipate themselves from the thralldom of ignorance, to become intellectual, as well as animated clay; and have shaken off that mental apathy and indolence, which has been the too general characteristic of the majority of the members of the working classes.

I may be allowed to say, in conclusion, that I think the writing of essays on a given subject, should be made matter of duty on the part of the Members of the Institution, who feel confidence enough to undertake such a task, without reference to the intrinsic value of the symbol of victory, which should animate them the same, whether it be a leaf of laurel or a crown of gold. I consider it matter of duty towards the generous donor of the munificent gift, for a part of which we are now competing.

It is our duty also towards those liberal and enlightened individuals who have filled the offices of lecturers and teachers, to endeavour to prove to them that the instruction they have imparted to us has not been lost, but that we have strove as far as time and circumstance permitted, to benefit by the knowledge they have so liberally diffused.

It is also no less a matter of duty towards the Members of the Institution, that those who have made more progress in their scientific career should at times retrace their steps, to impart fresh alacrity to their somewhat tired co-travellers, to invite the less industrious to increased exertion, and to assist as far as in them lies, those who are just entering upon the arduous task of studying the first principles of mechanical science.*

ON THE ALLEGED ADULTERATIONS OF BREAD.

TO THE EDITOR.

SIR,—In consequence of absence from London, I did not read the remarks of your correspondent, G. Whipple, before the publication of your last number, or I should have requested you to insert my reply in it. Never since the days of the perplexed Dogberry did unhappy wight seem so determined to be "writ down an ass" as this Mr. G. Whipple. The unfortunate gentleman has put himself in a "parlous passion," because I described a few tests for the discovery of the alleged adulterations in bread and flour, (which may be prepared and applied by any person without the possibility of error, even although he should be as ignorant of chemical science as Mr. Whipple himself,) and because I inserted the word "prodigious"

* In those portions of the Essay published in our previous Numbers there were some inaccuracies in the references, which will be pointed out and corrected in our next.

after a quotation of some of the most ridiculous tests ever recommended by ignorant presumption to blind credulity. He has commenced on me a personal attack, and has no right to complain if I reply in the same strain—

" Lay on, Macdub,

and I dare be that first cries hold, enough!"

He commences his observations by asserting, that the tests I proposed are clumsy and comical; in his hands they would very likely be so applied, and prove unsuccessful: he concludes, by advising me to try the tests myself. In reply to this, I must inform him, that I have tried them privately and publicly, and fearlessly repeat, that they may be fully relied on. But how does your correspondent prove the fallibility of them? Is it by any statement of fact or experiment? Is it by reason or argument? Oh, no; it is merely by putting the words ("so called") within parenthesis three times after the quoted word "tests," and by putting three notes of admiration after a list of them. Excellent proofs! Oh, Mr. Whipple, although you tell us twice over that you write for "housekeepers," and have a very long and funny tale of another old lady and her son, in which you seem a little more at home than in science, pray reflect that the Register of Arts is not read by old women only. With the old women you may pass for a man of science, but among men of science you will never pass for any thing but an old woman.

Your correspondent has taken a remarkably ingenious and facetious advantage of an expression in my last. I stated, that it was as little possible to mistake a mass of baked granite for a quartered loaf, as a mass of boiled sawdust for a plum-pudding: hence, he very wisely infers, that I have a "voracious appetite for plum-pudding," and designates me "your plum-pudding votary," and imagines that he has displayed a fine vein of irresistible satire and irony. If the casual employment of a word justify the application of it to the writer, I am certainly entitled to select any from my opponent's communication, and apply it to him. There is one favourite phrase of his so highly characteristic of the writer, that I should be equally justified in calling him henceforth "*the old lady*" Whipple.

Your correspondent states, that I contend these alterations do not exist, that I am convinced of their impossibility, and yet give tests for their detection, *ergo*, I am guilty of "manifest inconsistency." If any part of this statement were correct, I should certainly have appeared as desirous of exposing my folly as "*the old lady*" has of exposing her's, but not a sentence in my letter will justify the inference. I stated that, although I had no such fearful apprehensions as the Editor of the Times, and other devourers of the marvellous, that granite quarries and lime-pits were forming in our bellies by adulterated flour, yet that it was possible some of your readers might believe intelligence, horrible enough to convert them into stone without swallowing a loaf of granite, and therefore described modes of proving the fact. Is there no difference between doubting the correctness of a wild unauthenticated report in its fullest extent,

and stating the impossibility of the circumstance reported? Mrs. Whipple may not see any, but I am certain every other reader of the Register will.

* * * * *

The story of the old lady and her son is excellent, barring the bad grammar; and if he would describe further particulars of the habits and manners of those ladies who use their fingers in "the dividing of a plum-pudding" as he expresses it, they might be interesting, as we have no record of the manners of those who are sufficiently civilized to make plum-puddings, and barbarous enough to *claw* it to pieces with their *paws* afterwards.

I know not why "*the old lady*" should have been in such a *fluster* with me since our objects were so entirely different. He described for the benefit of "housekeepers" a mode suited to their capacity for detecting gross adulteration, without giving a clue for the discovery of the peculiar contaminating substance; I described for the readers of the Register tests which would indicate what the adulterating ingredient might be, if any existed. If the "infallible," "infallible," "infallible" test by crucible be adopted, the test I described, or others of a similar kind, must be resorted to for the analysis of the substance left in the crucible, and why should they not be previously employed? But if the "housekeepers" use the crucible, the salt and alum which would be left if the flour were dissipated in "thin air," would, no doubt, be taken for fluor spar, granite, or dead men's bones, and thus the groundless report be taken for a fact.

* * * * *

I am, Sir, your obedient Servant,
J. H.

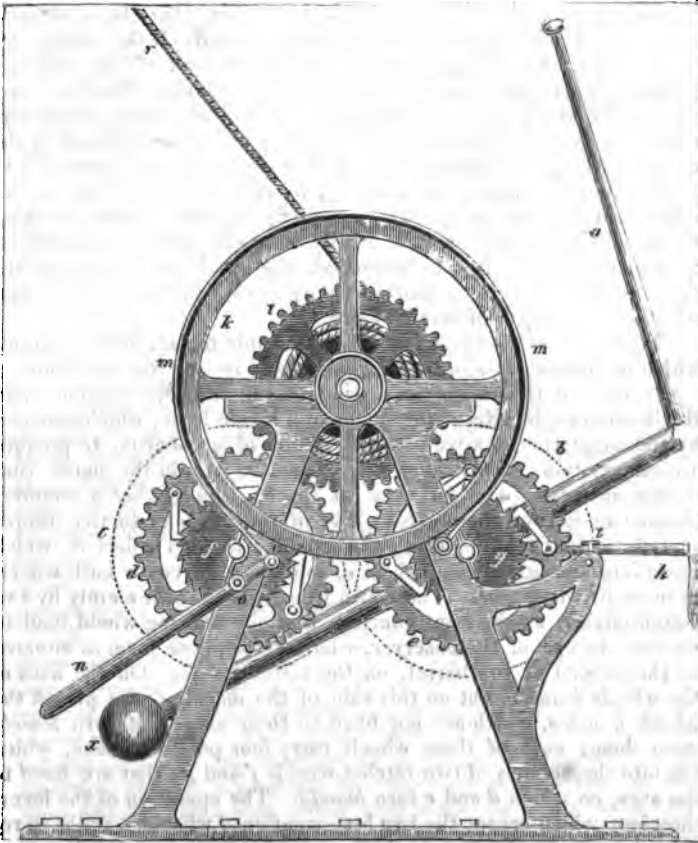
Jan. 3, 1829.

Roots—are materially determined in their form by the nature of the soil in which they grow, and the different nature and character of the plants and trees. Their development is most luxuriant in ground that is neither too loose nor too dense. In stiff and poor soils they are spare and scraggy; whereas in such as are at once deep and loose, the minutest fibres both expand and elongate with facility, and render the mouths that search for food to the plant almost innumerable. This is exemplified in the beech and sycamore, and still more in the ash, of which the fibrous roots sometimes amount to millions. Such soils accordingly furnish the best rooting ground, and are always favourites with the planter. To fit trees for removal to situations of great exposure, the roots may by artificial methods, be multiplied to a degree far beyond what can be accomplished by unassisted nature; and thus by art discreetly employed, the business of vegetation, that is, the circulation of the sap, is prevented from standing still, during the extreme violence, which transplanting in the best form must inflict.

TO OUR READERS AND CORRESPONDENTS.

We thank our Bath correspondent for his information, which will be attended to.

Other correspondents in our next.



**NEW PATENT CRANE OR MACHINE FOR
RAISING WEIGHTS,**

By MR. T. REVIS, of Walworth, Surry.—*Dated July 10, 1828.*

In a great commercial and manufacturing country, the improvement of an apparatus for raising and lowering weights, is obviously an object of great importance; and this circumstance will account for the very numerous machines that have been proposed for the purpose. The greater portion of these have, however, emanated from men, either ignorant of the principles of mechanics, or who have not duly

considered the properties of the lever, whatever skill they may have shown in producing a variety of *curious* contrivances. They appear, generally, to have imagined, that power *could be gained* by peculiar combinations, and to have overlooked the fact, that the wheel and axle is a continuous series of levers, which affords all the advantages of a smooth, undeviating, circular motion, instead of the shaking, jerking, alternating motion of distinct levers; saving thereby a vast deal of friction, complexity, and expense, and conferring simplicity, compactness, and strength. These points are so far attained in the common wheel and pinion crane, that it seems almost impossible to effect any improvement in it except by reducing the friction, or in *applying* the power more advantageously; i. e. that the men working the crane, shall exercise their bodily strength, with the most effect, for a continuance. But in almost all the attempts to improve the machine, we observe a multiplicity of parts, and generally a *less* effective application of manual force.

These observations we consider applicable to Mr. Revis's patent, which is, nevertheless, a very ingenious and respectable invention.

Instead of the turning of a winch, as in an ordinary crane, Mr. Revis employs the alternating action of a single lever, which is made, by the adaptation of a well-known species of mechanism, to produce a rotary motion. This lever is represented at *a* in the figure (but broken into two parts for want of space), and having a counter-balance *x*: it is on the opposite side of the machine to that represented, and its fulcrum being the axis of a toothed wheel *b*, which gears into another toothed wheel *c*, motion is given to both wheels in opposite directions. These two wheels are shown merely by two dotted circles, as their introduction into our drawing would tend to confuse the eye of the observer, who must suppose them as situated on the outside of the barrel, on the farthest side. On the axes of the wheels *b* and *c*, but on this side of the machine, are placed the wheels *d* and *e*, which are not fixed to their axes, but turn *loosely* upon them: each of these wheels carry four palls or clicks, which fall into the notches of two ratchet wheels *f* and *g*, that are *fixed* to the axes, on which *d* and *e* turn *loosely*. The operation of the lever, therefore, which causes the two first-mentioned wheels, *b* and *c*, to revolve in opposite directions, produces precisely the same effect upon the ratchet wheels *f* and *g*. It will now be observed, that the ratchet teeth and palls of both wheels incline, with respect to each other, in the same direction, and as the ratchets are turned round in opposite directions, the palls in one wheel slip over the ratchet teeth, while in the other wheel, the palls catch into the ratchet, and the latter is thereby locked to the toothed wheel, which now operates upon the toothed wheel *l*, on the working barrel, upon which the rope or chain *r* is wound: during this process, the other wheel and ratchet (which we will suppose to be *d* and *f*) has been producing no effect, from their not being connected; but upon reversing the motion of the lever, these become fastened together (while the former are simultaneously loosened); and as the wheel *d* revolves in an opposite direction to *a*, the wheel *l* is turned round in the same direction as

previously, and the rope or chain on the barrel proceeds in an uniform course.

Having explained that the motion of the lever *a* is communicated to the wheels *b* and *c*, and thence to the rest of the machine, it is obvious, that the putting the wheel *b* out of gear with *c*, will stop the forward action of the crane; this is effected by means of the lever *d*, which turns horizontally upon a fulcrum pin at *e*, and slides the axis in its bearings, so that the wheels *b* and *c* are placed out of contact with each other. This is done when it is intended to lower the rope or chain: but if a weight (or goods) be appended to it, the friction band *m* is made to press against the periphery of the fly-wheel *k*, by raising the lever *n*, which having its fulcrum at *o*, draws the friction band tightly over the fly-wheel, and the goods are thus lowered with safety and expedition.

PATENT STEAM CARRIAGE,

By JULIUS GRIFFITH, of Brompton, Middlesex, 1821.

IN the chronological account of steam carriages, given in our 17th Number, N. S., we observed that we hoped to be able to furnish our readers, at some future opportunity, with a description of this carriage. At that time a drawing had been promised us, but having never received it, we shall now endeavour to explain its construction without that aid. It should be premised, that although the experiments that were made with this vehicle proved unsuccessful, several of its mechanical combinations have afforded useful hints, which have not been overlooked by succeeding mechanicians in undertakings of a similar nature.

The body of the carriage was adapted to carry either goods or passengers; it was guided by means of a lever operating upon the fore-wheels of the carriage, so as to turn them round horizontally upon the ground, or to place them in an oblique position to make curves in the road. The yokes which carried the fore-wheels, were not connected to the main perch of the carriage, but to a short revolving perch. This perch was embraced at each end by an iron hoop, the one being fixed to the main perch, the other to the framing of the yokes, so that when the carriage passed over inequalities in the road, the carriage would oscillate upon the revolving perch, and preserve its erect position.

Two upright steam cylinders, with their piston-rods working a crank at right angles to each other, were employed as the propelling power; these, with their furnace, boiler, condenser, and other appendages, were situated on the hind part of the carriage; and to prevent them from partaking of the concussions and other irregular motions of the carriage, they were fixed upon a swinging platform, suspended to an elevated iron frame-work; and elasticity was given to the chains by the introduction of strong helical springs.

The boiler consisted of a series of metal pipes, into which water was forced by a pump from a reservoir. The steam from the engine was condensed in a series of flat pipes, exposed to the cooling

influence of the atmosphere, from whence the water run into the reservoir again.

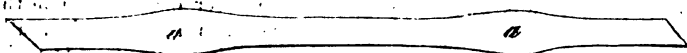
The power of the engine was communicated to the hind-wheels by means of sweep-rods, at the lower parts of which were pinions and detents taking into toothed wheels, which toothed wheels being fixed to the hind running wheels of the carriage, communicated their motion and impelled the vehicle.

PATENT CABLE AND HAWSER CHAINS,

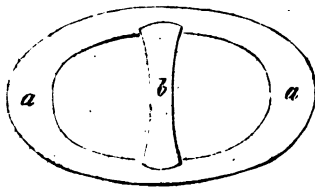
By MR. J. HAWKS, of Weymouth Street, London.—*Dated January, 1829.*

OUR readers are for the most part aware that the iron chain, commonly used for traces, and for some other purposes, are made thicker at the ends of the links than at the sides, on account of those parts having obviously to sustain much more friction and greater strains than the others. This mode of constructing chain, (technically called *knotted chains*) we considered was universally applicable wherever required. It would, however, appear from this specification that it was open to an individual to patent the application of it to *cable* and *hawser* chains, upon the ground, we suppose, of its being an improved construction of chains of this particular kind. The specification treats the invention entirely as new, and describes a process for making cable and hawser chains, which process may be in some respects novel; at all events, sufficiently interesting to be worth a brief description.

The iron rods of which the chain is made is not regularly cylindrical, but have bulbous enlargements at uniform distances apart, as represented at *aa* in the annexed figure, which are produced by



cavities in the rollers, whereby the rod is made; otherwise, by swaging or by forging. The rods being cut into exact lengths, they are turned round into links, and the ends welded together, when the bulbs should be situated exactly at the ends, as represented by the annexed figure at *aa*. The middle stay *b* may be either added to



the links or not. This part of the chain is not stated to be new; but we would just observe that it is a very important addition to a chain, as it prevents the sides from collapsing, an effect that always occurs before breaking, which effect, by materially weakening the cohesion, disposes the parts to separate the more easily.

DISTILLATION IN VACUO.

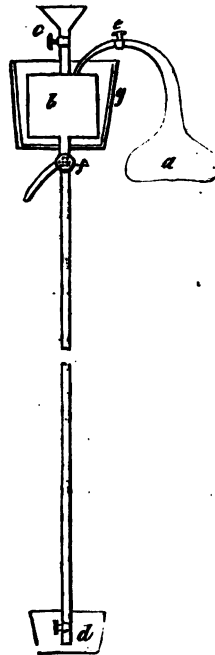
TO THE EDITOR.

SIR,—In Dr. Arnott's excellent work on the Elements of Physics, he has described an apparatus for distilling *in vacuo*, which, on account of its simplicity and cheapness of construction, I trust you will consider to be deserving of a place in your work, which has been rendered conspicuous by its containing almost every mechanical arrangement for the purpose of distillation.

The apparatus usually employed for evaporating and distilling in *vacuo*, consists of vessels strong enough to bear the atmospheric pressure when quite empty; the vacuum is effected and maintained by air-pumps worked by a steam engine or other power; or by expelling the air by the direct admission of steam, and then condensing the steam.

To supersede the necessity of air pumps, the Doctor observes, it is merely necessary to establish a communication between a close boiler, as *a*, and the vacuum at the top of a water barometer, as *b*. The strong vessel *b* forming the top of the barometer, and 36 feet of tube below, reaching to *d*, are first filled with water through a cock *c* at the top; this cock being then shut, and the cock *d* at the bottom being opened, the water will sink down out of the vessel *b*, until the column in the tube be only 34 feet high, as at *f*, that being the height which the atmosphere will support. On their opening a communication between the boiler *a* and the vacuum in *b* the operation goes on as desired, and the steam rising from *a* may be constantly condensed in *b* by a little stream of cold water* allowed to run through it from above. "This water," the Doctor observes, "it is evident, would always pass downward to the column below, without filling up or impairing the vacuum. If air should find admittance in any way, the perfect vacuum can easily be re-produced as at first."

g represents a refrigeratory, surrounding the vessel *b*; at *f* is a three-way cock, by the turning of which the condensed spirit may be drawn off, and the column of water separated from, or made to communicate with the same vessel.



* I have taken the liberty of varying the contrivance a little from Dr. Arnott's; instead of the small stream of water running through *b*, I have surrounded *b* with a refrigerating vessel of water, in the manner of the old-fashioned alembic.

Dr. Arnott states that he planned this arrangement as a simple apparatus for the preparation of medicinal extracts, as many watery extracts from vegetables have their virtues impaired or lost by a heat of 212° ; but when the water is driven off *in vacuo*, the temperature never need be higher than blood heat, and all the activity of the fresh plant remains in the extract. The Doctor further observes, that this plan appears "particularly well-suited for the Colonies, where air pumps and nice machinery can with difficulty be either obtained or managed. On many sugar estates there is a fall of water, which could supply the barometer, or by pumping. The tube need not be perpendicular; provided it be longer in proportion to its obliquity, and it may be very small; some yards of common lead pipe would answer."

In the upper room of a house that was 36 high above the basement, an apparatus of this kind might be very conveniently applied.

Your obedient Servant,

A HUMBLE BEE.

CAPTAIN FORMAN'S GRAVITOMETER.

AN instrument has lately been invented by Captain Forman, R. N. for ascertaining the relative powers of attraction in the sun and moon, and the ratio of the decrease of the power of gravity with the increase of distance.

We have extracted the following description of the instrument from a pamphlet published by the Captain, in which he maintains, that the irregularities in the vibrations of the pendulum, depending on other circumstances, than the differences of latitude, in the places of observation, renders the determination of the true figure of the earth, by that means, quite impossible. This irregularity he attributes to the different states of the atmosphere, and contends, that a pendulum performing an equal number of vibrations in equal times in a vacuum as in air, would not ascend to the same height each time, and consequently in every succeeding vibration, having a less space to swing, it would perform it in less time. From these, and other considerations, he concludes that the Newtonian philosophers are all wrong; and while he admits that he has not constructed the instrument by which he proposes to set the matter right, nor tried the experiments on which he grounds his opposition to their opinions, he complains that they have not adopted his method of investigating the subject. Our limits will not permit us to discuss these questions; nevertheless, the topics possess sufficient novelty and interest to entitle them to notice.

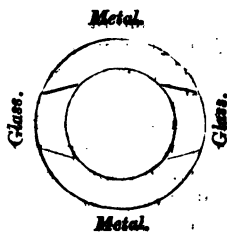
The following is the description given by the Captain, of his Gravitometer.

"It is well known that bodies (hollow substances) may be made to float at any depth in water by increasing or diminishing their weight; because a body will always float at that depth under the surface, where the weight of its entire bulk is just equal to an equal bulk of water; and, as water is a compressible substance, the weight of any

equal bulk of water increases with the increase of its depth, and consequently a body, that will not float at the surface of water, will float underneath, if its weight is exceeded by the weight of an equal bulk of water at the bottom.

"It is upon this principle that this instrument (which, until a better name can be found for it, I call a gravitometer) is intended to be constructed; and, as the fact itself cannot be disputed, no one I presume will deny that it is well calculated to produce the effect for which it is intended.

"Let a strong metal tube, about 5 feet long, $1\frac{1}{2}$ inch diameter in the bore, and closed at the bottom, be constructed and fitted to stand upright. In this tube let two *windows*, or slips of clear glass (about four feet long, and one inch wide) be inserted opposite each other, with the lower parts six inches from the bottom. These slips are to be cemented to the metal, and let in to the place prepared for them on the *inside* of the tube, as represented in the annexed figure, so that they cannot be forced outward by internal pressure, and then no hooping on the outside will be necessary though it might be as well to have one *strong* but *narrow* rim, about the middle of the slip; to strengthen the tube in that part where slips are to be cut out of the metal, to make room for the glass.



A hollow float (which I call the meter) upon the principle of those that are used for proving the strength of spirits, and of such a weight that it would require a depth of about 400 feet of water to lift it from the bottom, is to be placed in this tube, and then the top (with a hole in the centre about half an inch in diameter) is to be cemented on and screwed down, so that it will not give to the force of pressure, or suffer any water to escape at the joining.

"The tube is now to be filled with water, and a *polished* rod or stopper, made to fit *easily* in the hole in the top,* and passing through a stuffing box, is to be inserted. Upon this rod, a weight, equal to the weight of a column of four hundred feet of water, of the same dimensions as the bore of the tube (about 250 lbs.) is to be placed, which will force it downwards until the density of the waters be the same as it would be at the depth of 400 feet, when the resistance of the water below will be equal to the weight or pressure above, and then the bolt will proceed no further. As soon as this is done, the weight must be increased or diminished as necessary, until the meter float at about one foot above the lower parts of the windows, and then the bolt is to be securely fixed in its place, and the weight may be withdrawn.

"N. B.—By dividing the total weight (including that of the bolt and the water above the meter) by the weight of one foot of water, of the dimensions of the bore of the tube, we shall have the precise depth of water that would give it the same density. The interior of

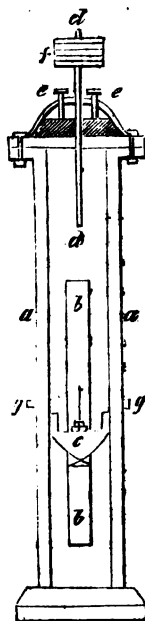
* The intention of making this hole so small is to diminish the friction as much as possible.

the tube contains 270 square inches, and if the weight of a column of water 400 feet high of the same dimensions ($1\frac{1}{2}$ inch diameter) did not exceed 270 lbs. the pressure upon the tube could not exceed *one pound upon the square inch*.

"In the annexed figure *aa* represents a section of the tube; *bb* the windows; *c* the meter; *dd* the stopper; *ee* stuffing boxes; *ff* the weights; and *gg* a metal rim or hoop to strengthen the tube.

"A scale of inches is to be placed by the side of one of the windows.

"The principle upon which I propose to construct this instrument is so simple, that it can hardly require an explanation. If the float were carried about in an *open* tube of water 400 feet in depth, the density of the water would increase or diminish in the same ratio with the increase or diminution of its gravity, by a change of place; and, consequently, as it would always remain at the same depth, it could not possibly indicate any change of gravity. The buoyant property of all fluids (and of all the parts of a fluid) is exactly proportioned to their densities; but the density of a fluid that is *confined* and compressed into a smaller bulk than its natural state, cannot be affected by any change of gravity; and hence it follows that, as the *density* of the water in the tube cannot be affected by a change of gravity, and the *weight* of the meter will, it will become more or less buoyant with every change of gravity, and its rise and fall in the tube will indicate that change. Supposing the total weight (including that of the water above the meter) to be equal to the depth of 400 feet, or 4,800 inches, a change to the amount of the 4,800th part of the gravity of the meter would produce a rise or fall of one inch, and a change to the amount of $\frac{1}{12}$ th part of its gravity would produce a rise or fall of one quarter of an inch, which could easily be detected."



ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

THIS work has already, in its accounts of mechanical inventions, included descriptions of upwards of one hundred different kinds of steam engines, besides more than thirty different boilers or other apparatus for generating the vapour, forming a fund of information on steam machinery which no other periodical ever contained: connected with these subjects, there remains, however, a topic which we are anxious to develop to our readers, namely, the various plans that have been adopted or proposed for the consumption of the dense smoke, which is emitted from the flues of steam-engine furnaces.

In our 34th number, present series, we commenced the first of a

series of papers on this subject, but the pressure of other matters obliged us to suspend their continuation for a while. In that number we noticed the serious nature of the evils, and the proceedings which had been taken by the legislature to prevent or remedy it, and at the same time added a description of one of the plans presented to the Committee appointed by the House of Commons to investigate the matter.

To the great improver of the steam engine (the late celebrated James Watt) belongs, also, the credit for having done more towards remedying this evil, than any other individual, since most of the inventors which have succeeded him in these attempts have trod nearly in his footsteps. It is now 44 years since Mr. Watt took out patents for several methods to attain this desirable object, and from the great similarity of the arrangements to many others of the present day, it is hard to believe the fact that this patent is dated June 14, 1785. From this circumstance, and our being unable to trace an earlier contrivance of any merit, we are disposed to give Mr. Watt the first place in inventions of this kind. As this great man speaks most intelligibly for himself, we shall content ourselves with giving the following extracts from his specification:—

“ I, the said James Watt, do hereby declare that the following is a particular description of the nature of my said invention, and in what manner the same is to be performed; that is to say, my newly improved methods of constructing furnaces or fire-places consist in causing the smoke or flame of the fresh fuel, in its way to the flues or chimney, to pass, together with a current of fresh air, through, over, or among, fuel which has already ceased to smoke, or which is converted into coke, charcoal, or cinders, and which is intensely hot; by which means the smoke and grosser parts of the flame, by coming into close contact with, or by being brought near unto, the said intensely hot fuel, and by being mixed with the current of fresh or unburnt air, are consumed or converted into heat, or into pure flame free from smoke.

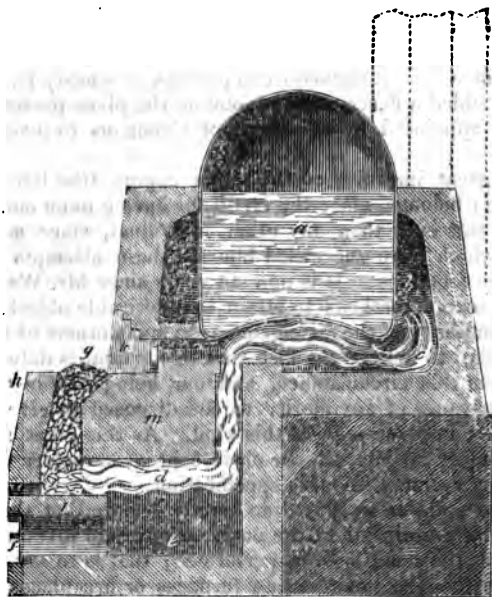
“ I put this in practice, first, by stopping up every avenue or passage to the chimney or flues, except such as are left in the interstices of the fuel, by placing the fresh fuel above or nearer to the external air than that which is already converted into coke or charcoal; and by constructing the fire-places in such manner that the flame, and the air which animates the fire, must pass downwards, or laterally, or horizontally, through the burning fuel; and pass from the lower part or internal end or side of the fire-place, to the flues or chimney.”

The annexed engraving represents a section of a steam engine boiler, and its furnace or fire-place, which is an example of this method of heating or evaporating of water.

PATENT FURNACE TO A STEAM ENGINE BOILER,

By JAMES WATT, Soho, Birmingham.—Dated June 14, 1785.

a is the boiler; *b* is a flue surrounding the boiler in the usual manner; *c* is the “up-take” or passage from the space under the

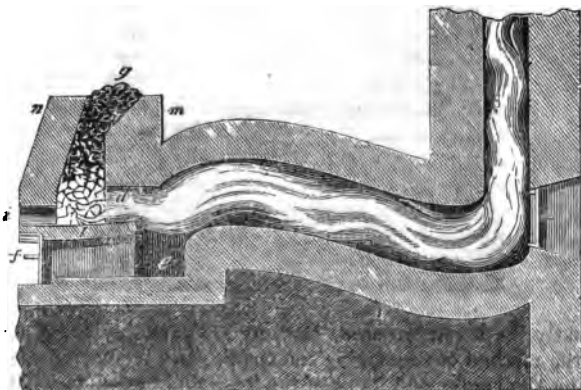


boiler to the flues; *d* is a flue for the flame from the fire-place to the boiler; *e* is the ash-pit, and *f* a door to take the ashes out at, which must be continually kept shut during the time of working; *g h* is the fire-place. The fresh fuel is put in at *g*, and gradually comes down as the fresh fuel consumes. About the middle of the fuel it is intensely hot, as it consists of coke or coals that have ceased to smoke. At *i* is an opening or openings to admit fresh air, and regulate the fire; *k* is a door into the space under the boiler, which being opened admits air, and stops the draught of the chimney when it is intended that the operation should cease. The fire is first lighted upon the brick arch *l*, and when well ignited more fuel is gradually added, until it is filled up to *g*, and care is taken to leave proper interstices for the air to pass, either among the fuel, or between the fuel and the front wall; and as much air is admitted at the opening *i* as can be done, without causing the smoke to ascend perpendicularly from *g*, which it would do if too much air be so admitted. The dimensions of the various parts of the fire-place may be estimated by *our engraving*, which is upon a scale of a quarter of an inch to a foot; which makes the furnace ten feet from front to back. Mr. Watt observes that the dimensions exhibited are adjusted for burning about 84 lbs. of coal per hour.

In some cases after the flame has passed through the burning fuel I cause it to pass through a very hot funnel, flue, or oven, before it comes to the bottom of the boiler, or to the part of the furnace where it is proposed to melt metal or perform other office, by which means the smoke is still more effectually consumed.

In other cases I cause the flame to pass immediately from the fire-place into the space under a boiler, or into the bed of a melting or other furnace.

The annexed engraving represents a vertical section of a furnace for melting iron or other metals, with a similar kind of fire-place to the foregoing adapted to it, in which the same letters of reference as in the preceding figure indicate similar parts in this.



PATENT FURNACE FOR MELTING IRON, &c.

By JAMES WATT, Soho, near Birmingham.—*Dated June 14, 1785.*

THE specification states that—"in some cases the part *g* of these fire places are preferred sloping, and otherwise varied in form and proportions; but in all cases the same principle, that of placing the fresh fuel next to the external air, so that the flame or smoke passes over or through the coked or charred part of the fuel." Occasionally the opening *g* is closed with a cover, to cause the air to enter wholly or principally at *i*."

The following figure exhibits a third arrangement specified in the same patent, and the principle is well-deserving of attention, as other patents have been subsequently taken out for similar inventions, arising, without doubt, from ignorance of this, which the public should know is open to their adoption.

PATENT BOILER FURNACE.

By JAMES WATT, of Soho, Birmingham.—*Dated June 14, 1785.*

MR. WATT says in his specification,—"in some cases I place the fresh fuel on a grate as usual, as at *a*, and beyond that grate, at or near the place where the flame passes into the flues or chimneys, I place another smaller grate *b*, on which I maintain a fire of charcoal, coke, or coals, which have previously burnt until they have ceased to smoke, which, by giving intense heat, and admitting some fresh air, consumes the smoke of the first fire."



" Lastly, be it remembered, that my said new invention consists only in the method of consuming the smoke, and increasing the heat, by causing the smoke and flame of the fresh fuel to pass through very hot funnels or pipes, or among, through, or near, fuel which is intensely hot, and which has ceased to smoke; and by mixing it with fresh air when in these circumstances; and in the form and nature of the fire-places herein mentioned, described, and delineated: the boilers and other parts of the furnaces being such as are in common use. And be it also remembered that these new invented fire-places are applicable to furnaces for almost every use or purpose. In witness whereof, &c."

AUSTRIAN PATENT FOR PREPARING MANURE,

By M. BERNARD PETRE.

It consists in a method of collecting manure in a way "to prevent the volatilization of gas, and to improve it to such a degree as to render it of six times the efficacy of other ordinary dung-heaps." The following is Petre's Patent Recipe. On an even and dry spot in the farm-yard, lay a first bed fifteen to twenty inches deep, consisting of litter, straw, or leaves, but little charged with excrement: with this may be mixed marl, bones, and all sorts of substances susceptible of putrid fermentation; fold horned cattle or sheep on the bed so formed, for several successive nights, then spread over it to the height of one-fourth of an inch of peat, charged with sulphur, or ash lye, or the one-eighth of an inch of mere cinders; then cover the whole with good mould or marl. On this bed form a second of the same depth as the first, of the dung of different animals; then lay on wood-ashes, to the thickness of one-eighth of an inch; or a quarter

of an inch of peat, charged with sulphur, or of soap-lye; or half an inch of cinders of potash, or merely common salt. As the heap gets dry, let it from time to time be watered. Lastly, cover it again with a three-inch bed of slime or mud or marly soil, and finish with a bed of wood cinders, &c. as before. The simple cinders are the best for the purpose. When the mass is in high fermentation, and smokes, let it receive another covering of soil, of the depth of three or four inches. The heap should be bored occasionally, to be assured that the fermentation proceeds duly, to replace the soil when it has sunk, to moderate with water the fermentation where it is too violent, and to give access to the air when it is slow. When the fermentation has ceased, the heap should be thoroughly watered in order to prevent the ulterior effects of the decomposition, and the volatilization of the gas. Finally, break up the heap, mix the elements well together, divide them into smaller quadrangular vertical-sided heaps to be left to the action of the air. As these dry, rake them or break them up, and scatter them in the form of dust at seed time.—*Bull. Univ.*

CULTIVATION AND PREPARATION OF TEA IN CHINA.

THE cultivation of tea is not general throughout the Chinese empire; the northern parts being too cold, and the southern parts too warm. The plant is the growth of a particular region, situated between the thirtieth and thirty-third degrees of north latitude, called the tea-country, *Tok-yen*, *Ho-ping*, *An-koy*, &c. There are some plantations near Canton, but they are few, and those that do exist are of no great extent. The trees are planted four or five feet asunder; they have a very stunted appearance; and they are not allowed to grow higher than is convenient for men, women, and children, to pick the leaves. The gatherings take place from one to four times in each year, according to the age of the plant. It is only the difference in the times of gathering, and manner of curing, which causes the distinction in appearance, qualities, and value; those which are gathered earliest in the spring, make the strongest and most valuable tea, such as pekoe, souchong, &c.; the inferior, such as congou, bohea, are of the latest gatherings—green or hyson can be made of any of the gatherings, by a different mode of drying. The first gathering of the leaves begins about the middle of April, and continues to the end of May; the second lasts from Midsummer to the end of July; the third takes place during the months of August and September. When the leaves are gathered, they are put into wide shallow baskets, placed on shelves in the air, or wind, or mild sunshine, from morning till noon; then, on a flat cast-iron pan, over a charcoal stove, ten or twelve ounces of the leaves are thrown at a time, stirred quickly with a short hand-broom twice or thrice, and then brushed off again into the baskets, in which they are equally and carefully rubbed between men's hands to roll them; after which, they are again put into the pan in larger quantities, over a slower fire, to be dried a second time. When fired enough, the tea is laid

on tables, to be drawn, or picked over, putting aside all the unsightly and imperfectly dried leaves, in order that the sample may be more even and marketable. To make single or hyson, the first two gatherings are chosen, and, as soon as picked from the trees, are put into the pan; next rolled, and spread thin, to separate the leaves, which adhere to each other; again well dried, spread, sifted, picked, and fired two or three times more (especially if it is damp weather), before it is in a marketable state.

The Chinese drink their tea without either milk or sugar; they partake of it plentifully at their meals, and very frequently in the course of the day. One mode of using it, amongst the higher ranks, is formed by grating into the cup, balls made of the most valuable leaves, cemented together by some kind of tasteless gum.—*Gardener's Magazine*.

MISCELLANEOUS INTELLIGENCE.

THE STETHESCOPE, OR CHEST INSPECTOR.—"The fact of solids conveying sounds so much more perfectly than air, has lately been applied in medicine to useful purposes. Dr. Laenae, of Paris, proposed some years ago to listen to what was going on in the interior of the body, and of the chest particularly, by applying one end of a wooden cylinder (which he called a *stethoscope*, or chest inspector) to the surface, and resting the ear against the other end. The results of this happy thought have been very important.

"The actions going on in the chest are, the entrance and exit of the air in respiration, the voice, and the motion of the blood in the heart, and blood-vessels; and so perfectly do all these declare themselves to a person listening through the stethoscope, that an ear once familiar with the natural and healthful sounds, instantly detects certain deviations from them. Hence this instrument becomes a means of ascertaining disease in the chest, and their vacuities, almost as certainly as if there were convenient windows for visual inspection. And when it is considered that a fourth or fifth part of the inhabitants of Europe die of chest diseases, such as inflammations, abscesses, consumptions, dropsical collections, aneurisms, and other affections of the heart and blood-vessels, each of which requires an appropriate treatment, the importance of the *stethoscope* may be judged of. By many medical men this instrument was ridiculed at first as quackery and nonsense, and very many have yet to learn the use of it. May not both of these facts be attributed to the error which has existed in medical education up to the present time, of leaving a majority of professional men without that knowledge of the general laws of nature, which should enable them to appreciate at once any means likely to be useful in their art, from whatever quarter it may be offered?"—*Elements of Physics*.

HARDENING OF STEEL.—According to M. Altmutter, when steel is hardened by being quenched in any other liquid than mercury, it is always more or less oxidized. According to him, immersion when

hot in mercury is the only method of obtaining steel hard and uninjured by oxidation.—*Jahrb. der Wien*, 1828.

PREPARATION OF GRAIN AND SEEDS BY CHLORINE.—M. Remond has been convinced, by numerous trials, that grain of all kinds, maize, the seeds of cruciferous plants, potatoes, &c., by treatment with chlorine, are very much increased in vegetative power, are sooner ripe, and produce a crop three or four times as great as that obtained under ordinary circumstances. His process is, to steep the seed for twelve hours in river water, (never in well water,) then fourteen or fifteen drops of a strong solution of chlorine is to be added for each litre (two pints) of water, the whole well mixed, and the maceration of the seed continued for six hours longer in the sunlight, and under a bell-glass, or, for want of a bell-glass, under a cover made with oiled paper. The seed is then to be separated from the liquid on a cloth, and, for the convenience of sowing, mixed with a sufficient quantity of cinders, sand, or dry earth. When sown, the water of maceration is to be poured over the ground.—*Quarterly Journal of Science*.

FULMINATING POWDER.—According to M. Landgerbe, a mixture of two parts nitre, two parts neutral carbonate of potash, one part of sulphur, and six parts of common salt, all finely pulverized, makes a very powerful fulminating powder.—*Bull. Univ.*

SOURCE OF SALT IN SEA-WATER.—It has been supposed by some naturalists, that the salt in the sea has been gradually augmented by saline particles brought into it by rivers, but this cause is totally inadequate to explain the immense quantity of salt existing in the whole mass of the ocean. If the average depth of the sea be ten miles, and it contains two and a half per cent. of salt, were the water entirely evaporated, the thickness of the saline residue would exceed 1000 feet.—*Bakewell's Introduction to Geology*.

FRICTION OF SCREWS AND SCREW PRESSES.—An examination of the friction in screws having their threads of various forms, has led M. Poucelet to this very important conclusion, viz. that the friction in screws with square threads is to that of equal screws with triangular threads as 2.90 to 4.78, proving a very important advantage of the former over the latter, relative to the loss of power incurred in both by friction.—*Quarterly Journal of Science*.

INTENSE LIGHT.—The intense light produced by igniting lime in the oxy-alcohol flame, is well known, and has been beautifully applied in the geodesical signals by Lieutenant Drummond. It is said that a very ready mode of exhibiting it on a small scale is to place a small piece of lime on charcoal, lighted, at the spot by a little piece of tinder, and throw a jet of oxygen from an ordinary blow-pipe aperture upon it.—*Id.*

ROSSES.—A curious work has lately been published at Paris, entitled "Rosetum Gallicum;" or a methodical enumeration of the species, and varieties of the genus, *Rosier*; either indigenous in

France, or cultivated in gardens." The following list of *some* of the most interesting of the species, amounting to 79 in all, will give an idea of the great number of varieties.

Species.	Varieties.	Species.	Varieties.
Rosier mousseux.....	18	Rosier de Damas	117
— des chiens	20	— cent fenilles	121
— des Alpes.....	21	— pimprenelle	123
— de Francfort	30	— blanc	125
— thé	42	— de Bengal	254
— rubigineux	57	— de Provins	1215
— noisette	89		

COMPOSITION OF HAIL STONES.—On analysing small stones inclosed in hail which fell in the circle of Sterlitamak, in the government of Orenburg, in 1825, they were found to contain in a hundred parts, of red oxide of iron 70.00, of oxide of manganese 7.50, magnesia 6.25, alum 3.75, flint 7.50, sulphur and waste 5.00.—*Bulletin Univ.*

GRAVEL WALKS.—The following cheap improvement has been recommended in the construction of walks in gardens, lawns, &c. uniting the advantages of great hardness, durability, and freedom from worms and insects. When a new walk is made, or an old one reformed, take the necessary quantity of road scraping, previously dried in the air, and reduced as fine as possible; mix with the heap enough of coal-tar from a gas-work, so that the whole shall be sufficiently saturated, and then add a quantity of gravel;—with this lay a thick stratum as a foundation, and then cover it with a thin coating of gravel. In a short time the walk will be as hard as a rock, not affected by wet, or disfigured by worms.

SUPERIOR INTELLIGENCE OF THE DOG AND ELEPHANT.—The dog is the only animal that dreams; and he and the elephant the only animal that understand looks: the elephant is the only animal that, besides man, feels *envy*; the dog, the only quadruped that has been brought to speak. Leibnitz bears witness to a hound in Saxony, that could speak distinctly thirty words.—*Med. Gaz.*

LIST OF PATENTS

That Expire in the present Month of January, 1829.

CLOTHING.—To Joseph Harris, of Shire Lane, Middlesex, for improvements in military clothing. Dated January 4, 1815.

CEMENT.—To Charles Dhl, of Brewer Street, London, for a mastic cement, denominated Dhl's Mastic. Dated January 6, 1815.

STOVES.—To John Cutler, of Great Queen Street, Lincoln's Inn Fields, for improvements in stoves, &c. Dated January 6, 1815.

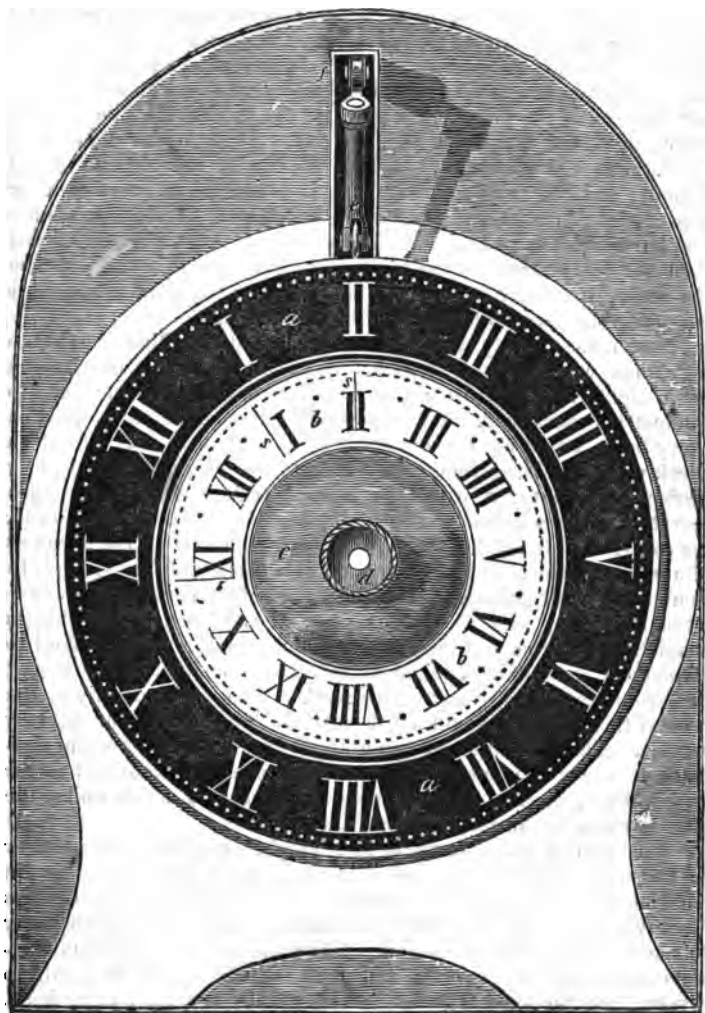
RAISING WATER.—To James Collier, of Pimlico, Middlesex, for a machine called a *Chicoryrite*, for raising water.—Dated January 16, 1815.

WARMING ROOMS.—To Frederick Marquis de Chabams, of Thayer Street, for an improved calorific apparatus.—Dated January 16, 1815.

TELESCOPES.—To Jean Rodini, of Oxford Street, for improvements in the construction of dioptric telescopes. Dated January 20, 1815.

KNAPSACKS.—To John Carpenter, of Truro, Cornwall, for an improved knapsack and pouch. Dated January 20, 1815.

DISTILLATION.—To James Miller, of Craig-end, Stirling, Liverpool, for improvements in stills, furnaces, &c. Dated January 26, 1815.

**PATENT DUTY REGISTER,**

By MR. KNIGHT, 15, ANN STREET, BIRMINGHAM.—1828.

THE *Patent Duty Register*, or, as perhaps it might have been more properly called, the *Watchman's Cheek Clock*, is a very ingenious though simple contrivance, to obviate the necessity of the guardians of the night giving notice to thieves of their approach, or in other

VOL. III.—NO. 58.

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10 FEB. 1829.

words, of "crying the hours." This practice was designed to operate as a check upon the indolence of the watchman, and it certainly affords a demonstration of his presence, thereby leaving him but little excuse for not performing the more essential part of his duty, should there be occasion to exercise it. The inconveniencies, however, of this *noisy* mode of *watching*, more than counterbalance its advantages; not the least of the former of which, are the putting the thieves upon their guard, and disturbing people's rest. According to the present regulations, the watchmen go their rounds at regular and stated periods, and the burglars consequently take care to carry on their depredations during the absence of the watchman. But if we suppose that the watchman and thief are in league (and such things have been) then the noise made by the bawling watchman will serve to drown the noise, that may be unavoidably made by the thief while he is executing the most violent part of his operations.

Now if the "Duty Register" were adopted, the time at which a watchman was required to go his silent rounds might be changed every night, and the thief would be left without any guide when to conduct his operations. The expense of the machine, if adopted on every beat, would not be very great; but if it were only used as a check upon the inspectors, who, it is to be feared, too frequently neglect their duty, it would be a mere trifle. As a check upon private watchmen in manufactories and large establishments generally, the contrivance is invaluable, especially as it answers all the purposes of a common clock, and is constructed in a variety of forms, so as to combine even elegance with a useful piece of furniture. In this situation it may be used as a check upon servants generally, whilst a conviction of the correct information which it will infallibly afford to employers, must have a tendency to ensure punctuality on the part of those from whom it may be required. We see no reason why the uses of this machine should not be extended to the naval and military service. The captain in his cabin might thus be assured of the vigilance of the watch upon deck; and the commanding officer in the guard-house, in like manner, have the means of ascertaining the attentiveness of the centinel upon duty.

The train of wheel-work in Mr. Knight's machine being similar to those in ordinary clocks, the invention must be regarded as an addition or appendage, which is capable of being applied to clocks already made, as well as to those which are manufactured purposely to receive the new combination. The only essential variation consists in causing the circular dial-plate, which is usually fixed, to revolve, and the hand or index, which usually revolves, to be fixed. This stationary index is placed at the top of the circle, and the hours as they successively come under it, denote present time. This index forms part of a bended lever, the fulcrum of which is in the interior or back of the clock, and the other extremity of it is attached to a bell wire, with suitable cranks to carry the line of communication to the required place, where a handle is connected to it, for the individual who is upon duty or guard, to pull at stated times; this operation raises the power end of the lever, and depresses the index,

which makes a mark upon a temporary scale of hours fixed to the dial-plate, and indicates the precise time at which each mark was made. As the lever has only one centre of motion, it follows, that the index, which forms a part of it, moves in the arc of a circle, and consequently would only strike upon a *point*; but to enable it to make a *line*, there is a spring joint where the lever is bent to a right angle, which allows the extremity of the index to move in a right line over the plate. The clock-face has two concentric circles of hours, the outer permanent and of a full size, the inner temporary, and of small dimensions. The latter is an engraved print, the divisions upon which correspond radially with those on the outer circle, and it is intended that a fresh card should be put on the dial-plate every day; it is contrived so as to enable them to be put on with accuracy and expedition; the card taken off forming a register of the duty performed.

a is the revolving metal dial-plate; *b* the revolving card, *c* an ornamented metal shield, to confine the card down to the plate, which is fixed to it by means of a thumb screw *d*; *l* is the marker, formed of a little sharp-edged wheel, revolving in a cleft at the extremity of the index, like a spur rowel only without teeth; at *f* is the spring joint of the lever, (before mentioned), forming the upper extremity of the lever. On depressing the lever, the end *f* takes the position of *e*, while *c* descends on the card dial and makes the mark. In our drawing, the time expressed is *two o'clock*, and if the handle be pulled, the index will descend from the position represented, and make the line drawn between the *II* marked *s*; there are two other lines made upon the drawing also marked *s*, which are intended merely as examples, to shew that such marks were made at the time expressed, by the person on duty. The projection of the index in front of the dial is exhibited by the projection of its shadow thereon.

PATENT PROCESS IN SMELTING ORES,

By A. F. MORNAY, Esq. of Putney Heath, Surry.—*Dated March 27, 1827.*

THE processes described under this patent appear to be important improvements in the art of smelting copper, lead, and other ores. The specification is divided into two parts; the first part relates to the *preparation* of the ores previous to their being put into the furnace, which being strictly speaking the *smelting* process forms the second part.

In lieu of the table usually employed for washing or concentrating substances containing metals, which is a *fixture*, the patentee employs one which is capable of receiving an alternating motion, from a steam engine, or other first mover. This motion aided with a flowing of water, will, it is said, separate the various substances submitted to their joint action according to their respective gravities. Tables for this purpose may be considerably varied in form, but the patentee recommends the following construction and proportions as convenient for most descriptions of ore.

A rectangular frame of timber 16 feet long, and 5 ft. 6 in. wide, over which is to be nailed smooth deal boards: the table thus formed is to be suspended at its four corners by chains to four upright posts (firmly braced in their positions by cross timbers,) leaving sufficient room to allow of the free motion of the table between them. The two chains at the head of the table support it a few inches below the edge of the slope over which the "feed of ore and flow of water" are supplied; but the two chains at the lower end of the table are fastened to an horizontal beam, whose extremities slide in vertical grooves in the two upright posts, and is thereby elevated or depressed, by means of a long lever, the handle of which reaches to the upper end of the table. By this simple arrangement the inclination of the table is easily adapted to the circumstances of the process; the angle of inclination being varied according to the relative difference of specific gravities of the substances under operation, and with the utmost facility until the separation of the component parts are effected. The water which flows over the table is received in a trough at the end of it, wherein the matter carried with it is deposited. When the trough is full, the matter suspended in the water is carried over and deposited in other reservoirs, which must be more or less extensive according to the difficulty of separating the valuable from the useless matter.

At about three feet distance from the lower end of the table, a slit or opening 2 inches wide is made across its whole breadth. Whilst the washing of the ore is proceeding this slit is plugged with a long slip of wood which just fits it, and over this slip lies a long piece of leather, which is nailed on one of its edges to the adjoining edge of the table.

When the operation of washing is finished, the slip of wood is removed, the flap of leather is pushed down so as to hang in the slit, and the valuable matter collected on the table is swept down through the slit into another trough placed to receive it. The motion is given to the table by means of a beam which is placed horizontally at the head of the table, in such a position, as when impelled by a crank connected to the motive power, it propels the table from the upper to the lower end; and the beam being drawn back again with greater rapidity than the table swings back, the latter strikes against the end of the beam, and at the moment previous to the table being propelled forward again; the repetition of these shocks has the effect of separating the various substances operated upon according to their specific gravities. The manner of feeding the table, and supplying it with a stream of water, is the same as usual.

The patented improvements in *smelting* consist in the application of a blast furnace in lieu of the ordinary reverberating or air furnace, and it is constructed of the form of a four-sided prism, 12 feet high, 3 feet wide, and 3 feet deep, and lined with fire bricks set in loam about 18 inches in thickness. The masonry without the lining is about 3 feet thick.

These furnaces the patentee prefers building in pairs, by uniting two of the side piers into one of double the width; and leaving a

passage on the outward side of each pair for the convenience of the workmen to pass conveniently from the front to the back of the furnaces. One wide chimney of a pyramidal shape is placed over both furnaces, and carried 10 or 12 feet higher than their tops. Arched doorways are formed in one side of the chimney, for feeding the furnaces with the substances to be smelted, the fuel, and the flux required for the reduction. A strong floor is erected at a level of about 2 feet 6 in. below the top of the furnaces on the same side as the arched door-ways, upon which the prepared ores are placed ready to be projected into the furnace when at work. The front of the furnace is left open when first built, and is afterwards bricked up with fire bricks to the breadth of a single brick, and resting on a bar of iron placed across the open front at about 4 feet from the bottom of the furnace, and the portion below the bar is bricked up in like manner when the furnace is about to be used. By this arrangement an opportunity is afforded of removing the lower division during the operation, if required for any purpose, (such as the removal of clinkers, &c.) without disturbing the other part.

The blast is admitted at the back of the furnace, the tuyeres for which are placed about 18 inches above the bottom of the furnace. The bottom is formed of a mixture of loam and ashes, and is made to slope upwards from the front to the back: small channels are also made under ground from the bottom of the furnace, to allow the vapour from the damp earth to escape, which might otherwise cause an explosion.

Close to the front of the furnace, and level with its bottom, a hearth is formed of loam and ashes of the whole width of the furnace, about 3 feet broad and 9 inches deep, which is supported by slabs of iron or stone; on a level with the surface of the hearth two holes are made, 3 inches wide and 4 inches high, in the front wall of the furnace, very near to each other, therefore, towards the middle of the front. These two holes are stopped with clay or loam during the process of fusion, and one or more basins, about a foot diameter, are scooped out of the hearth; to the right and left of the two holes coke, wood, and lighted shavings are thrown into the furnace, and a gentle blast given to heat the furnace gradually; then if copper ore (for instance) be to be smelted, about half a hundred weight in the raw state, that is, *without any previous roasting or calcining*, is thrown in from the top of the furnace upon the ignited fuel; immediately afterwards a farther supply of coke is added, and a small quantity of coal ("with a view to economy"); then more ore and fuel in succession until the furnace is filled to the top.

During this process a part of the charge will have been smelted, and one of the holes before-mentioned having been opened, the melted matter will flow out into one of the basins formed in the hearth. This matter consists of slag and metal, the latter is very impure, consisting of copper, sulphur, and some iron; the slag, which covers the surface quickly sets by cooling, and is removed in a cake, by means of an iron fork. The metal is slower in setting than the slag, but is removed in like manner by the workman, as it separates in thin cakes or layers. When one basin in the hearth is filled, the

other is brought into use by opening the second hole in the front of the furnace; at this time the workman occupies himself in discharging the contents of the first basin.

In this manner the process of smelting may go on night and day, without cessation, the furnace being continually fed from above, and the melted matter flowing into the basins in the hearth below. The necessity of roasting or calcining the metal being in the opinion of the patentee completely obviated by the structure and height of these furnaces, which continually exposes the ore in large quantities to a sufficient heat above the blast or melting point to deprive it of the chief part of its sulphur, as effectually as by the usual distinct process of calcination.

The patentee observes that the quantity of fuel to be used will be indicated by "the extent of the dark tuyere, which is formed immediately before the blast," and that this dark tuyere ought always to be about 8 inches long, in a furnace of the size described. The state of the dark tuyere is to be constantly observed by the workman to guide him in his operations. If too much fuel is used, the dark tuyere will be too short, and vice versa: and if the blast be too feeble the dark tuyere will not be formed, or when formed it will melt again and disappear. Should the materials in the furnace be at any time refractory, the usual addition of fluor spar as a flux will assist the operation.

In operating upon galena, or lead ore, the patentee directs the same process to be pursued, with this variation only, that of adding cast-iron to absorb the sulphur; this should be reduced to fragments, or it may be granulated by pouring the metal into water from the high furnace in which it was smelted.

PATENT FOR EXTRACTING SPIRITS

And other Solvents from the substances they hold in solution, and which are used in the stiffening of Hat Bodies, &c. By WILLIAM WILSON, of Martin's Lane, Cannon Street.—*Dated August 27, 1827.*

THE invention or process intended to be described by the specification of this patent is simple enough, but the wording of it betrays such excessive ignorance in the writer, that we are almost tempted to give it verbatim, by way of cautioning patentees to employ persons more competent to execute documents of such essential importance to the validity of a patent.

To render felted hats, caps, &c. impervious to rain, and at the same time to give them sufficient rigidity to preserve their shape, it is usual to saturate them with a solution of various resinous matters, and afterwards to allow their liquid solvents to evaporate in the open air, by which they are lost to the manufacturer. The patentee of this invention proposes to economise the process by extracting the spirit after it has diffused the resin throughout the felted substances, by a distillatory process.

For this purpose a steam-tight box is provided, in which are placed the hat bodies, (after having received their "stiffening,") on

their blocks or cross frames, the pins in the centres of each of which are stuck into apertures made in a suitable frame-work fixed inside the box; by this arrangement each hat body is kept distended, and without touching each other. Steam from a contiguous boiler is now admitted into the box, which is allowed to operate upon the hats for ten or twelve minutes, by which the patentee says that the spirits and other solvents used in dissolving the "gums" will be extracted and drawn off in vapour, and the "gums" will remain in the hat bodies. The aqueous and other vapours contained in the hat-box are passed through the convoluted worm of an ordinary refrigerator to condense them; hence they are collected in a receiver, wherein the patentee says the *different spirits* separate themselves, each according to its specific gravity, which will require rectifying before being again fit for use.

ON FURNACES FOR CONSUMING THEIR OWN SMOKE.

Continued from p. 140.

THE next record of an apparatus for the consumption of smoke, since the date of Mr. Watt's patent, described in our last paper, is the subject of a communication made to the Society of Arts in 1790, by Mr. W. Pitt, of Pendeford, near Wolverhampton, wherein he describes a mode of converting the smoke arising from steam-engine furnaces into tar, with a view to prevent annoyance to the neighbourhood, and obtaining a quantity of a very useful material. We make the following extracts from Mr. Pitt's letter.

"That the object is not only attainable, will be demonstrated in the following narrative;—but also that valuable articles of commerce may be produced in large quantities, whenever the proprietors of such works shall adopt the mode of constructing their buildings proper for such production.

"The articles of commerce I allude to, are mineral tar, pitch, and varnish: there are already three considerable works erected on the banks of the canal in this county, for the purpose of converting the smoke of pit-coal into the above articles; the one at Mr. Wilkinson's great works at Bradley, another at Tipton, and a third at the level colliery and iron works upon Dudley wood: they were erected by Lord Dundonald and Co. and the business is carried on with success.

"These tar works are erected in the vicinity of large iron and coal works: the iron masters furnish the tar works with raw coal, gratis, and receive in return the cokes produced by such coal; and the proprietors of the tar works have the smoke only for their labour, and interest of capital.

"The process is conducted in the following manner:—a range of eighteen or twenty stoves is erected, and supplied with coal-kept burning at the bottom; the smoke is conducted by proper horizontal tunnels, into a capacious and close funnel, of one hundred yards or more in length; this funnel is built with brick, supported by brick

arches, and covered on the top by a shallow pond of water, which pond is supplied with water, when wanted, by a steam-engine belonging to the coal or iron works; the chill of the water gradually condensing the smoke, it falls upon the floor of the funnel in the form of tar, and is conveyed by proper pipes into a receiver, from whence it is pumped into a large boiler, and boiled to a proper consistence, or otherwise inspissated into pitch: when the latter is the case, the volatile particles which arise during the inspissation are again condensed into an oil used for varnish.

"In this process the smoke is decomposed and destroyed, nothing arising from the work but a white vapour from some small funnels (kept open to give draught to the fires), and a small evaporation of water from the pond, occasioned by the warmth of the smoke within the funnel.

"The process requires but little attendance, the principal labour being that of supplying the fuel. In any one of the tar works the quantity of coal used is about twenty tons per day; three labourers, with a foreman, are sufficient for the whole business: the quantity of tar produced will be about twenty-eight barrels, of two hundred weight and a half, in six days, worth ten shillings per hundred; or twenty-one barrels of pitch of the same weight, worth fifteen shillings per hundred; though I was assured upon the spot, by a very intelligent person, that some coal is of so bituminous a quality, as to give one-eighth its weight of tar: but the quantity above stated is about the average produce.

"In order to bring the above practice within the Society's intentions, an alteration in the erection of steam-engines, furnaces, &c. must take place; the alteration will be no more than that of erecting them below ground, instead of above: and when raising water is the main object, an adoption of the forcing or lifting pump instead of the sucking pump, or the sucking pump may be still employed, wherever the fall of ground gives an opportunity of letting off the water raised, by an aqueduct; in which case, the lift being shortened, and less power necessary, ample amends will be thereby made for the expense of such aqueduct.

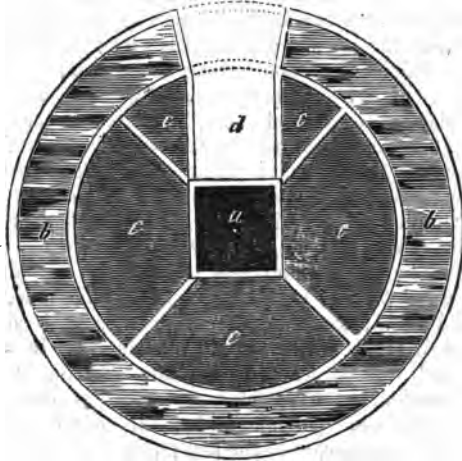
"Such kind of buildings, from a low situation within the earth's surface, will certainly acquire additional stability: and to those who are acquainted with the trifling expense of removing soil to small distances, the additional charge will appear trifling, and will be more than recompensed by such acquired stability. In some local situations, in hilly countries, the smoking works being erected at the foot, and the tar funnel higher up the hill, a communication may be effected without such alteration.

"I find by reports from other quarters, that successful attempts have been made to make cokes of the coal employed in working steam-engines: the additional improvement of making tar from the smoke, would not only prevent annoyance to the neighbourhood, but also apply to the best advantage every particle of that valuable and comfortable article, coal; prodigious quantities of which are at present wasted by being burned in one place for heat only, in another

for cokes only ; when, by due attention, both purposes may in many cases be effected at the same time.

" I was informed on the spot, from undoubted authority, that the consumption of coal in Mr. Wilkinson's great works, at Bradley, is one hundred tons per day : about one-fifth of the smoke is actually employed in making of tar ; and the remainder, or the smoke of eighty tons per day, flies away. This, if collected, would yield upwards of eighteen barrels of tar, of two hundred and a half each : and if the smoke of the great works of the kingdom was in general collected for the same use, what a prodigious addition would it be, to the production of a commercial and necessary article, which always finds a ready market, and will in many instances supply the place of the vegetable tar, at present imported from abroad !

" The tar works at present erected, are in an oblong form : it is probable, if the idea above described is adopted, a circular plan would be most suitable, somewhat similar to the drawing annexed.



" Explanation of the plan.

a is the steam-engine, the base of which suppose thirty feet below the earth's surface.

b b the tar funnel, supported by arches, and covered with water, suppose the water fifteen feet above the earth's surface.

c c c c c area sunk nearly as deep as the base of the building *a*.

d gang-way, level with the earth's surface.

1, 2, 3, 4, funnels communicating from the main chimney to the tar funnel.

" I am, Sir, your very humble Servant,

" WILLIAM PITT."

Pendeford, Dec. 15, 1790.

**ON THE MEANS OF IMPROVING THE QUALITY,
AND INCREASING THE QUANTITY OF FOOD.**

THE New Monthly Magazine for this present February contains, under the head of "Rural Economy," an article on the economy of using extensively the farina of the potatoe in lieu of wheaten flour; but the writer has made such extremely gross errors in his calculations, that we are fearful the discovery of them (and they are too prominent to be overlooked by the most careless reader) will mar the good effect which the statement, were it strictly correct, would be calculated to produce. We are quite satisfied ourselves that great benefits would result from the use of this flour, though we do not agree with the writer that they are "*almost too great for the mind to conceive*." We annex the article verbatim, and shall submit our observations in a few notes.

"An eminent political economist says, 'every county which depends chiefly on potatoes for food must be frequently exposed to scarcity, because the surplus of one year's crop *cannot* be preserved to supply the deficiency of another, as in the case of grain.* The extreme poverty of our people has compelled them to subsist almost entirely on this root for several years, and it has therefore become an object of the highest importance to discover a remedy for the above defect. Since the famine which prevailed in Ireland in 1821, I have paid great attention to this subject, and I found that this purpose might be accomplished in various ways; but the conversion of potatoes into flour, I consider far superior in utility to any other means. By many experiments, I found that potatoes of a good quality will afford about a *fourth* part of their weight of this flour, if carefully prepared, and of the same degree of dryness with common flour. Fourcroy says it yields a fifth, some chemists say less, and others say more;† and it is notorious that a large portion of what is sold in our shops under the name of arrow root, is actually this flour manufactured at home. Accum stated this many years ago, and medical men are quite aware of the fact; nor is the purchaser injured by this deception, the one being in all respects precisely the same with the other, of which any body may satisfy himself by comparing them. I have very often known persons who had long been accustomed to the use of arrow-root in the West Indies, take the potatoe-flour in its stead, without ever suspecting any difference, nor is there

* The writer cannot here mean the flour of potatoes, but potatoes in the gross, as he says further on, that he has known the flour to be preserved for eight years. We make no doubt that it would in a dry state keep good for centuries.—ED. REG.

† The quantity of farina varies considerably in different kinds of potatoes, but we are inclined to suspect that all the accounts which we have seen published on the subject state the product too high. It happens that we have been a *large* experimenter in this matter, having reduced some tons of potatoes to pulp, and extracted the flour, which averaged, when perfectly dry, about an *eighth* part of the original weight of the potatoes.—ED. REG.

indeed any.* The two roots are the natives of the same country, and entirely of the same quality; they are also applied there to the same purpose, arrow-root being used for starch as well as the potatoe flour. This flour is admirably adapted for commercial purposes; from its great value in small bulk, and it may be kept without damage for a great length of time. I happen to have known it preserved for eight years, without any change whatever. This article has long been used by several respectable families in the Highlands of Scotland, as a substitute for wheaten flour, on a small scale, for curiosity, though it has never been turned to any public advantage as food, as far as I know. I have myself, however, used it for a considerable time in my own house in large quantities, with great satisfaction, for puddings; pancakes, and all sorts of pastry. It is incomparably good; boiled in milk, or water coloured with milk,† it makes excellent food, and mixed with a small portion of common flour, with eggs, or even with mashed potatoes, it makes the finest loaf bread; and improvements in cooking it will no doubt be shortly made. In short, it is in all respects superior to wheaten flour, and equal to arrow-root.

"The enormous quantity of potatoes which the stomach requires, and which the system requires for nourishment, when it is the sole food, cannot fail to injure that organ, and diseases of that class have therefore become very frequent of late years, to the unspeakable distress of the lower orders. On weighing the measure of potatoes usually allotted for a labourer's meal, I found it amounted to *six pounds*, and from that I procured a pound and a half of flour; which afforded eight breakfasts for my own use, each consisting of two table spoonful of the flour boiled in a pint of milk. This very interesting fact may give us some idea of the importance of this subject. Here we have many wholesome, delicious, nourishing, nay, luxurious meals, for one very bad one:‡ in consequence of the very easy process which the material had undergone, the worst of all human food is converted into the very best." * * *

"The average produce of an acre of land under potatoes over the United Kingdom, cultivated by *the spade*, may be calculated at from

* Potatoe flour may be known from arrow root flour, by rubbing a little of it between the finger and thumb, when it will be observed that the potatoe flour is softer to the *touch*, and more shining to the *sight*, than that from the arrow root. The mucilage or jelly formed with boiling water is in both cases alike, though some good women make serious charges against one or the other, namely, that they "*turn to water*." This effect we can tell them does not take place unless sugar is put to the solution; for although water has a great affection for starch, it likes sugar better, and if left alone will gradually steal away to the latter.—ED. REG.

† The genuine London sky-blue is probably here meant.—ED. REG.

‡ This is neither fair nor true. Where are the labourer's *eight pints of milk*? Let the potatoes be properly boiled for the labourer, and let him have eight pints of good milk therewith, and we will bet our philosopher a ducat that he would in a few days be glad to exchange his porridge for a nice salted dry and floury potatoe, with a draught of milk. It will be observed further on, that the author says "*the refuse will make delicious pudding*." This pudding the labourer makes in his stomach, but does not enter the philosopher's porridge.

150 to 200 barrels, or from 14 to 18 tons, which will yield from 3 to 4½ tons of flour, or from 50 to 70 bolls of 140 pounds each.* In 1800, an acre of land in Fifeshire produced 80 bolls of potatoes, or 320 barrels, for which a premium was given by the Highland Society.†

“Now our best land under wheat will not average above six or eight bolls an acre. The return of flour from wheat is very various. (A. Young, says that the average produce of England is about twenty-two bushels an acre.) When we add to this the superior quality of this flour, we have here an advantage *almost too great for the mind to conceive*. Immense as the advantage is, however, it is unquestionably true, as may be easily proved by the infallible test of experiment, which all, even the poorest can easily make, and to which they are earnestly intreated to have recourse.

“The annual expense of supporting the poor in England and Wales cannot be short of eight millions, including every shape in which charity is bestowed. Under this system, let an acre of *land*, and the *milk* of a cow, be assigned to every four poor families; with these, and a few *hens*, they may live comfortably. To breakfast and supper they may have this flour boiled in milk, and to dinner, by the addition of eggs, they may have pudding or pancakes, while they themselves may cultivate the ground. This is stated as *one of the innumerable* blessings which may flow from this improvement. If the yearly produce of this kingdom be worth several hundred millions, as political calculators assert, what must be the value of that discovery which increases that produce many fold? by the cultivation of this system, in two years Great Britain and Ireland, instead of depending on other countries for food, may supply the greater part of Europe; and even China would maintain many times its population.‡ According to the usual price of potatoes the boll of this flour will cost seven shillings, or fourteen shillings the sack.§ The pound will cost about a halfpenny, and half a pound about the average consumption of a family.||

“Now this is the very same article which the rich and luxurious at

* The average of this estimate makes potatoes—175 barrels = 16 tons × 2240 lbs. = 35840 lbs. ÷ 175 barrels = 204½ lbs. per barrel.

Flour 60 bolls × 140 lbs. = 8400 lbs.

† This estimate makes of potatoes 80 bolls × 140 lbs. = 11200 lbs. ÷ 320 casks = 35 lbs. per barrel.

Suppose one-fourth of flour will 20 bolls × 140 lbs. = 2800 lbs.

In this last case, therefore, we have nearly double the number of barrels, yet only one-third of the weight of flour of the former. What is the reward of the Highland Society for? Were it for blundering calculations, the “eminent political economist” would be sure of it.

‡ After the two years have expired, and our “eminent political economist” has supplied Europe from our soil, we earnestly hope he will extend the cultivation to the Continent, as he may then, according to his mode of calculating, be able to potatorise the whole world, China included. All Birmingham may then be employed in making spoons!

§ When 13 lbs. of potatoes can be bought for a penny, and two or three hours labour may be had for nothing, this may be done, but not before.

|| A single labourer had 1½ lbs. to himself, yet to a whole family he now gives but half a pound.

present enjoy, and actually consume in large quantities, at the exorbitant price of two shillings the pound, or twenty-eight pounds the sack, under the foreign name of arrow-root, and we have lately seen it at double the price, while all this benefit is obtained at no expense whatever.* Eighty bolls of this *flour*, being the produce of an acre, if sold at two shillings the pound, as arrow-root, would amount to £1120.†

"Perhaps there is no process more universally known than the manufacture of this flour, under the name of potatoe starch. By means of a barrel lined with sheet iron grating, placed in an axle horizontally, like a butter churn, the women and children of a family may prepare any quantity of this flour, and this barrel will supply fifty or sixty families, at an expense of less than one shilling each. The pulpy mass may be filtered through the milk strainer, or a coarse cloth, diluting it plentifully with soft water; it may be dried on linen, or on boards in the sun's rays, or in an oven, over a slow fire, stirring it frequently. The *refuse* which remains in the filter, will make delicious pudding, if prepared in the same manner as rice, and the water is a powerful detergent.

"Corn must be thrashed, fanned, kiln-dried, ground, and sifted, all of them laborious, tedious, and some of them very expensive operations, while potatoe flour may be prepared without any expense, and it may be used as food in the course of three or four hours after the root is dug from the ground, though for preservation, it must be rendered perfectly dry. In course of time, mills will no doubt be constructed for grinding, or washing, or filtering it, and proper kilns for drying it. The estimate which our people already have of this article, under a different name, and for another use, ought to favour the rapid progress of this discovery."

The principal error of the above writer consists in his having adopted the unphilosophical notion, that *a part is greater than the whole*, (though we must confess that the most "eminent political economists" entertain the same notion, and that we see it very generally acted upon :) let him however prove that a portion of the farina, (about four-fifths are taken away by the grating process, &c.) is more than the whole, and that the sugar, the fibre, the gummy mucilage, and the other vegetable principles which he throws away, are *nothing*, we will then give him a mealy potatoe for an ounce of his starch.

For affording an abundant and wholesome variation in food, and for *preserving* the most essential nutritive parts of the potatoe, which would otherwise perish, the separation of the farina is an object of public as well as private importance. Such a resource as a store of potatoe flour is at all times valuable, but in seasons of scarcity of grain, invaluable.

In the first volume of the Register of Arts, p. 375, is a correct

* This is new in political economy, to value labour at nothing.

† The economy of converting the eighty bolls of potatoes before mentioned, into eighty bolls of flour, is beyond all praise.

description of a machine for the purpose of separating the flour of the potatoe, &c. (invented by the editor, and communicated to this work previous to his undertaking the management,) which we conceive to be the best hitherto projected; for reasons given in the description of it.

Having given the subject much consideration since, we are prepared to make some great improvements in the apparatus, and the process, in which a capitalist might embark with certain assurance of good profit, and by which the public would derive considerable advantages.

MISCELLANEOUS INTELLIGENCE.

GRUBWORM.—"As this destructive insect occasions great loss among oats after lea, I beg to state, for the information of your agricultural readers, that during the last fourteen years, I have invariably got completely rid of them by dibbling, and though in 1818, I had upwards of sixteen acres, which to all appearance were gone, so much so that my neighbours advised me to plough them up. I persevered, had an excellent crop, and sold the whole for £11:14s. per acre; while those around me who persisted in rolling during the night sustained a total loss. By laying seed in a barn floor, sprinkling it with strong brine of salt and water, or byre wash, and allowing it to remain twelve hours previous to its being sown, I have escaped the grub; but, I can speak with confidence of the dibbling system, which, after many trials never failed. The process is simple, and the expense from 3s:4d. to 4s:2d. per acre. When the brair turns sickly and yellow, be assured the grub has been busy. Examine the surface, turn over a few pieces in the evening, and under each, two, four, six, and often more will be found. Lose no time in rolling (which is merely to smooth and firm the surface), then put two or three women on each ridge, according to its breadth, with iron shod potatoe dibbles, and let them proceed entering it about six inches, and turn it round, leaving the whole entire and smooth, and about 12 or 14 inches separate every way. As night approaches the worms move about, and falling into the holes, remain there. I have often found from 8 to 16 in each. In the morning they soon die, and in the course of the day have the appearance of a spoonful of common train oil; and unless it be from this very substance affording additional nourishment, to the roots (which are generally entire in the early stage, the worm cutting near the surface until necessity compels it to attack the last vestige,) I am at a loss to account for the crop, when thus infected and treated, being always the best in the field. Any one can satisfy himself of the efficacy of dibbing, by trying a few yards, and I have found that four or five women will easily do an acre."—*New Monthly Mag.*

NATURALIZATION OF ANIMALS.—At one of the recent sittings of the Academy of Sciences at Paris; an interesting paper was read by M. Roulen, on the changes which the domestic animals of Europe

undergo when transported to the equatorial regions of the new world. The author's observations are stated to have been made in New Granada, and a part of Venezuela, from the 3rd to the 10th degree north lat., and from the 70th to the 80th degree of west long. He states at the commencement of his paper, that the mammiferous animals brought from the old to the new continent, are pigs, sheep, goats, asses, horses, cows, and dogs, all of which are become more numerous than the indigenous animals of the new countries. It appears that the hog in the warm valleys of South America, wandering in the woods, and subsisting upon wild fruits, becomes very ferocious, and assumes almost the character of the wild boar. Horses, and horned cattle also soon become wild, and it is with the utmost difficulty they can be retained for domestic purposes.

It has been observed that the best treatment to ensure fecundity in these was to pasture them in situations where the food possessed saline properties; in places where the quantity of salt, either in the water or plants was small, they were found to deteriorate in quality and to diminish in number. In these climates the cow undergoes a material change. It no longer furnishes the constant supply of milk which we obtain from it by artificial means in Europe; and in order to obtain that fluid at all, it is necessary that the calf should be continually with its mother. The milk obtained for domestic use is only that which accumulates during the night, when the calf is in a quiescent state. When the calf ceases to suck, the milk immediately dries up.

The ass undergoes less change in these climates than any other animal. A curious phenomena has been noticed regarding the wool of the sheep introduced from Europe into the valleys of South America. The wool of the lambs grows at first as in more temperate climates, but rather slowly. When in a fit state for shearing there is nothing remarkable about its quality; and when removed it grows again as in temperate climates; but if the proper time for shearing is allowed to go by, the wool becomes thick, falls off in patches, and leaves underneath, not a new growth of wool, or a barren place as if from disease, but a short, shining, and close hair, exactly like the hair of the goat in the same climate; and where this hair once appears, there is never any return of wool. The goat, notwithstanding its form, which appears adapted to mountainous situations, thrives much better in the low valleys of South America, than on the high points of the Cordilleras; and it undergoes a mammiferous change similar to that of the cow.

Among birds the changes have not been great. The conclusions drawn from this report are; First, that every animal, like man, requires time to accustom itself to climate; Second, that domestic animals when left to themselves, have a great tendency towards the organization of those of the same species in a wild state; and that a very short time only is necessary to produce that transformation.

CAPACITY OF NEGROES.—Professor Blumenbach possesses a little library of works written by negroes, from which it appears, he says,

that there is not a single department of taste or science in which some negro has not distinguished himself.—*Med. Gas.*

BRUTE ANIMAL HAY-MAKERS.—Marmots, in the strictest sense, make hay; they bite off the grass, turn it, and dry it in the sun. It is reported that they use an old she marmot as a cart. She lies on her back, the hay is heaped on her belly, and two others drag her home.—*London Medical Gazette.*

EVIL CONSEQUENCES OF ROCKING CHILDREN.—It is doubtful whether the practice of rocking infants, when often repeated, be not the origin of many of the diseases of children. When the human offspring first begins to make use of its faculties, and to give proof of its being sensible to existence, even should this be done by infantine cries, is it right to stop those cries, and to prevent its paying that tribute to nature? The rocking of the cradle brings on sleep only through the stupor it produces on the senses. Such a motion cannot but offend the delicate fibres of the brain of an infant, injure his digestion, sour the milk from which it derives its nourishment, and turn it into curds.—*Bibl. Ital.*

PRESERVATION OF APPLES.—Apples to be preserved should be laid on shelves; the fruit should be gathered before it is fully ripe: neither apples nor turnips will keep, nor have a good flavour if allowed to grow to their full size. The best place for keeping apples is like the best place for keeping ale, &c. viz. a good cellar.—*Gard. Mag.*

TENDER MEAT.—The surest and most convenient way of rendering meat or poultry speedily tender, is to wrap it in a cloth to preserve it from dirt, and expose it the preceding evening to a gentle and constant heat, such as the hearth of a fire-place.—*Jour. des Cona. Usuelles.*

LIST OF NEW PATENTS SEALED.

NEW MOVEMENT.—To William Parr, of Union Place, City Road, and James Blunett, of Blackwall, for a new method of converting a rotary into a reciprocating action. Dated 22 Dec. 1828. Two months to enrol specification.

TABLE FORKS.—To G. Rodgers, J. C. Hobson, and Jonathan Brownill, of Sheffield, for improvements in table forks. 22 December. Two months.

STEAM NAVIGATION.—To O. H. Williams, of North Nibley, Gloucestershire, for improvements in paddles and machinery for propelling vessels. 7 January. Six months.

STEAM NAVIGATION.—To Septimus Critten, of Fentonville, for an improved construction of paddles. 7 January. Two months.

STEAM NAVIGATION.—To Francis Neale, of Gloucester, for machinery for propelling vessels. 7 January. Six months.

HARNESSES AND SADDLES.—To William Taft, of Birmingham, for improvements in harness and saddlery. 7 January. Six months.

STEAM NAVIGATION.—To A. Robertson, of Liverpool, for improvements in paddles. 7 January. Six months.

WORKING HORN.—To James and Thomas Drakin, of Sheffield, for certain methods of making various articles from horns and hoofs of animals. 14 January. Two months.

PAPER MAKING.—To John Dickenson, of Nash Mill, Abbott's Langley, Herts. for various improvements in the manufacturing and the cutting of paper. 14 January. Six months.

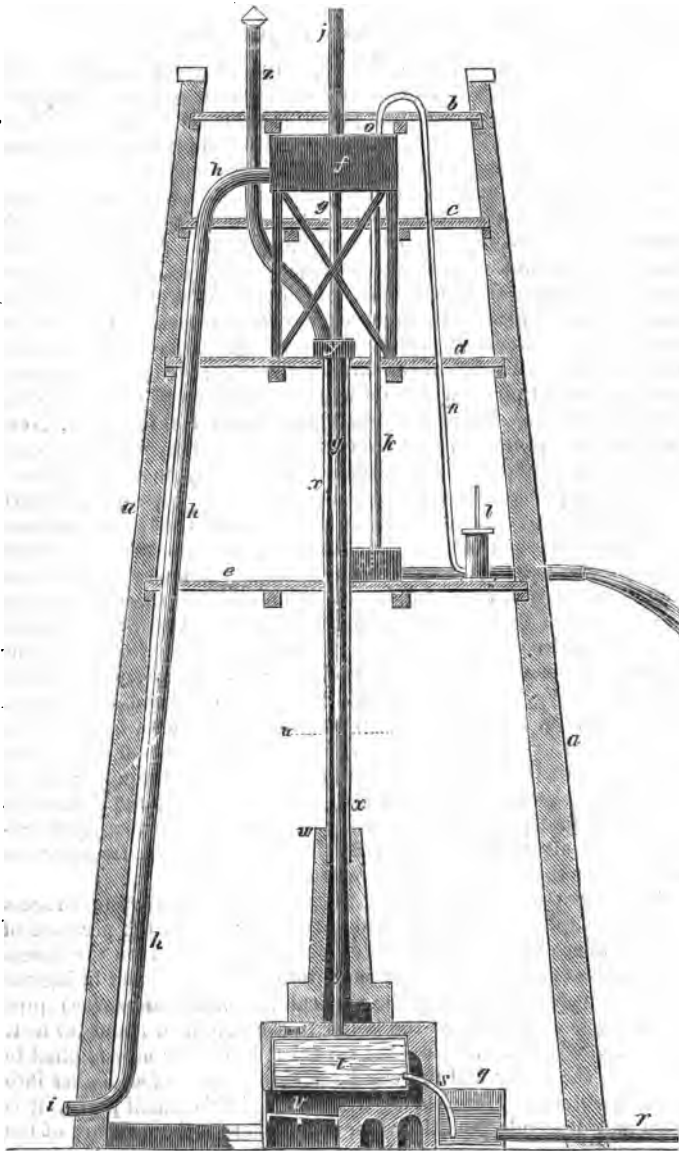
APPARATUS.—To Thomas Smith, of Derby, for an improved piece of machinery applicable to steam engines, pumps, water wheels, &c. 14 January. Six months.

WINDMILLS.—To John Cheek Hewes, of Manchester, for improvements in the construction of windmills. 14 January. Six months.

STEAM ENGINE.—To John Udney, of Arbour Terrace, Commercial Road, for improvements in the steam engine. 14 January. Two months.

STEAM NAVIGATION.—To William Erskine Cockrane, Regent Street, for an improvement upon paddle wheels. 14 January. Six months.

STOP-COCKS.—To J. M. Rose, of Symond's Inn, for an improved cock or tap for drawing off liquids. 19 January. Two months.



**BERNHARDT'S PATENT MACHINERY FOR RAISING
WATER TO GREAT HEIGHTS.**

PATENT MACHINERY FOR RAISING WATER,

By ANTON BERNHARD, Esq. of Finsbury Square, London—*Dated*

By a peculiar combination of apparatus of great magnitude, in which the joint action of exhaustion, atmospheric pressure, heat and condensation are employed, the patentee proposes to raise water to a height exceeding fifty feet, with the view of applying the fall from that elevation as a motive power for impelling machinery.

The water to be raised runs from its level into a cistern contiguous to the foundation of a large boiler, and from the latter proceeds downward a curved pipe dipping into the cistern. At the top of the boiler there is another pipe which leads shortly into a vertical pipe, upwards of eighty feet in height, which the patentee terms the *hot water ascending pipe*. To preserve the temperature of the fluid in this pipe, the lowermost portion of it, to the extent of 30 feet, is inclosed in the brick flue of the furnace chimney: hence it is inclosed in an iron funnel pipe, which forms the remainder of the flue to the top of the building, which is a pyramidal tower 100 feet high. Near to the top of the tower is a refrigeratory, formed by a judicious arrangement of two tiers of pipes, placed horizontally, in a wooden case; into these pipes the hot water in the ascending pipe (which here terminates by branching off from the flue) is discharged. Throughout the refrigeratory box, and surrounding the pipes a current of cold air is continually passing; this is brought from the lowest part of the building through a large tube, and is discharged through another proceeding from the top of the refrigeratory, and extending to 25 feet above the altitude of the tower, to cause a strong draught. The effect of this current of air is to cool the hot water distributed in its pipes, from the lower tier of which it runs out, and descends a vertical pipe 36 feet in length, whose lower extremity is turned up and immersed in a cistern of water, to seal it from the air; this pipe the patentee calls the *cold water descending pipe*: the upper end of it communicates with the exhausting pipe of an air pump, which is used in the first place, to obtain a partial vacuum in the pipes described, and afterwards to abstract the air disengaged from the hot water during the progress of the operation.

The reader will now perceive that when the exhausting process is nearly completed by the working of the air pump, the pressure of the atmosphere will force the water out of the cistern on the lowest level up the curved pipes mentioned into the boiler, and filling the same, the water will rise up the vertical (*hot water ascending*) pipe proceeding from the top of the boiler to the height of about 30 feet. This being effected, the patentee says that if heat be now applied to the boiler, the water will thereby be made to rise 50 feet higher into the refrigeratory. Here, being distributed in the small pipes, it is cooled and descends the cold water pipe, wherein the pressure of the column of water, being greater than that of the atmosphere, the water will run out over the cistern, and will continue to do so, until the equilibrium is restored, which it is the object of the patentee to prevent, and thus obtain a constant power by the fall of the water

from the cistern. Having so far explained the object of the patentee, and the principle upon which he intends to operate, we shall now describe the apparatus more particularly, with reference to the preceding engraving, which is merely a diagram of the apparatus, as complete drawings of it would require several figures.

a a represent the walls of the building; *b c d e* four floors in the same; *f* the refrigeratory which communicates with the hot water ascending pipe *g*; *h h* is the air tube which receives its supply at *i*, and after blowing through the refrigeratory, escapes by the tube *j*, which extends 25 feet above the tower (but is shown for want of room as broken off); the water in the refrigeratory is prevented from returning by the intervention of a valve, and after being cooled in passing through the series of pipes runs down the pipe *k*: at *l* is the air pump with the pipe *n*, which connects it to the top of the pipe *k*, through the medium of which the other pipes are exhausted. *q* is the reservoir which receives the water upon the natural level, by a channel as at *r*. The operation of the air pump causes the water to rise up the pipe *s* into the boiler *t*, thence up the pipe *g* as high as the dotted line *u*; after which heat being applied to the boiler by the furnace *v*, the hot water rises to the refrigeratory. About midway of the pipe *g* there is a stuffing box at one of their junctures to allow of the expansion and contraction of the metal by changes of temperature. The pipe *g* is shown as extending vertically through the brick chimney up to *w*, thence through the flue *x* to the box *y*, hence it proceeds to the refrigeratory, and the flue pipe takes a bend as at *z*, and proceeds to the top of the building.

It does not appear to us probable, that this apparatus will answer the patentee's views. To keep it in action, heat must evidently be applied in sufficient quantity to render the pressure of a column of water about 80 feet high less than that of a column of water 30 feet high, which has been cooled by passing through the refrigeratory, the practicability of which is not very apparent. And were it practicable, we much doubt whether it would be an economical mode of raising water to that height; these are, however, problems which will soon be practically solved, as Mr. Bernhard is erecting a work of the kind on the banks of the Surrey Canal in the Kent Road.

NEW DRAWING PEN.

By Mr. R. CHRISTIE, Secretary of the London Mechanics' Institution.

WE are much gratified in being the medium of conveying to artists and draftsmen the knowledge of a simple means of constructing an excellent drawing pen, from materials always at hand, and in the space of few minutes! However diffident we might be in giving an opinion on many subjects, in *this* we are just the reverse; and have no sort of hesitation in denominating ourselves a most wise and excellent judge in the matter thereof: indeed, it cannot well be otherwise, since we have almost eternally a drawing pen stuck between our fingers. Some readers may say, "pity that a *writing* pen ever came there;" we think so too; but fate placed it there, and we had

no alternative; therefore if we cannot do any better, we will at least tell the grumblers how to make a good drawing pen; or rather, how we made one in the space of five minutes, after having received the necessary instructions from its highly-gifted contriver.

Upon the blind end of a black-lead pencil was stuck a piece of sealing wax, by melting it, of the size of a goodly marrow-fat pea, forming therewith a bulb; then was stolen out of a lady's needle-case three of her veritable *No. 7 darning needles*, (none of your White-chapels, they won't draw fine), and having successively warmed their eyes in the flame of a candle, they were buried under the wax at equal distances apart, around the circumference of the pencil, with their points extending about three-quarters of an inch beyond the end of it, and brought together so as to meet as accurately as possible at a common focus. In this position, the needles formed the outline of a triangular pyramid, and they were thus secured by placing midway between the aforesaid bulb of wax and the points, another piece of wax of the size of a grain of rice, and carefully melting the same. The very acute points of the needles were next taken off by light rolling touches upon an oil stone, and the raggedness by a little fine emery paper, so as to produce an obtuse conical end, that is to say, such a point as would bother a person (if in a hurry) to pierce diametrically through the centre of a fine hair. The pen was thus completed, and found capable of *drawing exceedingly fine, clear, smooth, uniform lines, in every direction, with equal facility, and entirely free from scratch or splutter!*

The pen sketched in the margin is one that we have fabricated since the former upon a smarter stock, and we find the convenience and advantage of it so great, as to feel it a duty to lose no time in publishing it for the benefit of our brethren of the craft, and of all whom it may concern. With a pen of this kind (which costs less than one penny in materials, and no more time than is occupied in setting a common drawing pen,) lines may be drawn so exquisitely fine that two of them drawn close together will appear as one line, until examined by a magnifying glass, when they will be found to be distinct and perfect lines. The chief excellence of these pens, however, consists in their making straight and curved lines with equal freedom and smoothness in *every* direction; this is far from being the case with an ordinary drawing pen, which young draftsmen find exceedingly troublesome and difficult to manage; instead of being driven half mad with gouty, ragged, squatchy, spluttering, lines, they may now draw away with all their might with the same ease as with a black lead pencil, and make only such lines as a limner would adopt for the eye lashes of a flea.



PATENT SHAVING BRUSHES,

By MR. J. WOODMAN, of Piccadilly.—1828.

THIS is one of those marvellous inventions which portend serious changes in Britain's destiny, and which was so clearly foretold by the immortal Moore! It is a bold step, however, in the "march of intellect" that a Piccadilly Perfumer should *dare* to propose to shave us by a *steam engine*! It is true *he* does not venture to give his patent machinery such a name, but *we* who are mechanics know very well, that when he introduces our chins to "cylinders and pistons," that there is some risk of getting them steamed also; and although the specification of the patent does not extend beyond the description of brushes, it must not be supposed that more is not meant than meets the eye.

It is merely stated that a tube is to be put in the handle of shaving brushes, to form a magazine for soap, or soap paste, which being pressed forward, as occasion requires, by means of a piston, forces the soap or paste amongst the bristles or hairs of the brush: the latter therefore needs only to be dipped in fair water, which will save all the labour and inconvenience of making a lather in a separate apparatus.

Painting brushes, scrubbing brushes, nail brushes, and indeed almost all sorts of brushes are to be made on the same principle, to which the patent right extends.

PATENT SMELTING FURNACES.

By Dr. B. SOMERS, of Langford, Bennington, Somerset.—Dated April 28, 1828.

THE proposition of the patentee consists in the application of the slags obtained in the process of smelting, as the material for building furnaces in lieu of the ordinary bricks. An iron pan is to form the lower part of the furnace, with tapping holes for drawing off the fluid metal; round this pan the walls are to be formed of the usual inclination and figure with slags of ore, well rammed and beaten together, to render the fabric as compact as possible; and, in order to get solid and impervious walls, fires are to be repeatedly applied during the progress of the building, of sufficient intensity to partially fuse the walls, the substance of which is to be renewed by fresh portions of slag wherever, and as often as may be necessary, and until the whole of the interior of the furnace presents an uniformly compact and vitrified surface, which will, after cooling, be unalterable, from the ordinary heat of the fires employed in the operations of smelting.

ON FURNACES FOR CONSUMING THEIR OWN SMOKE.

Continued from p. 153.

NOTWITHSTANDING the premium offered by the Society of Arts in the successive volumes of their Transactions for a long series of years,

it does not appear to have been productive of any feasible plans being communicated to the Society, for the consumption of smoke; which may be accounted for by the reward being probably considered, as inadequate to the value of the discovery. We are strengthened in this opinion by observing, that the authors of every crude scheme which had the least degree of originality in it, taking out patents for them. The following specification affords an instance of this, which we insert verbatim, as it is not long; and as the undefined manner in which the invention is described makes it somewhat hazardous to explain with certainty what were the exact arrangements intended.

Patent method of changing the smoke or vapour arising from the combustion of many kinds of substances into various useful materials.
By C. W. WARD, of Hatton Garden, London. Dated March, 1792.

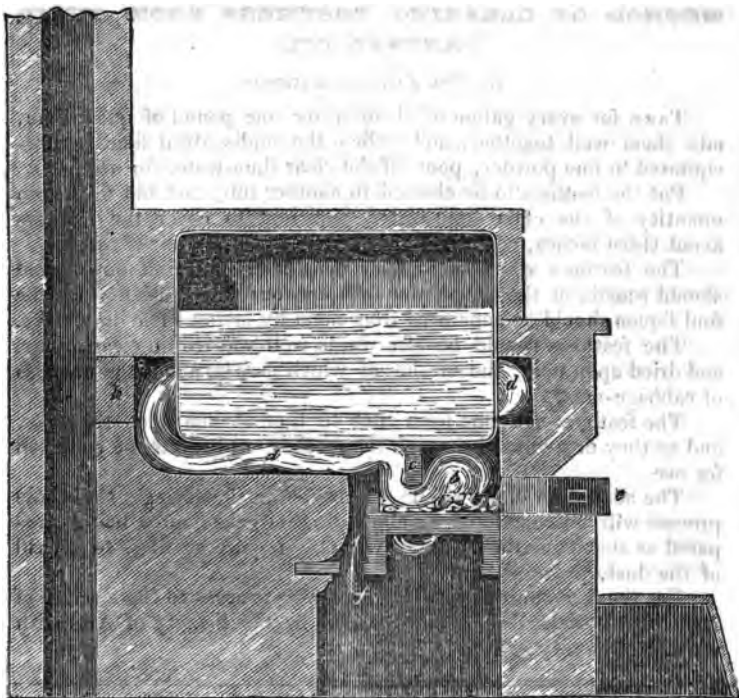
"Now know ye, that I, the said Charles William Ward, in compliance with the proviso in the said letters patent contained, do hereby describe and ascertain the nature of my said invention of a method of changing the smoke, or vapour, arising from the combustion of many kinds of substances into various useful materials, according to the substances burnt as follows. All smoke or vapour from the combustion of different bodies, is capable of being decomposed or condensed; but as the vapours, according to the substance they proceed from, require to pass through cold water, the steam of boiling water, or to be confined some time in cold vessels, before they can be condensed, the change cannot be effected by any method hitherto known, because none of them are capable of making the vapour pass through water, or of confining it long enough to condense, without choking up the draught of air necessary for the burning of the fires. My invention supplies this defect, by making a constant draught from the fires, and causing the vapours to pass through, or be retained in, proper vessels a sufficient time for it to condense; this is effected by connecting the aperture of the chimney or chimneys, with the condensing vessels or chambers, by means of tubes or pipes; then is to be placed, either between this connection, or behind the condensing vessels, any machine, or machines, whose principle depends upon the known property of all fluids rushing in to fill up the vacuum caused by their action, that is to say, air pumps, water pumps, ventilators, bellows, air machines, &c.; these, however different their constructions, have all one common principle, and therefore the application of them, or others depending upon the said principle, to effect the purpose before mentioned, will be an infringement upon my said patent; the size, number, and construction, of the condensing vessels, must depend upon the vapour to be decomposed, as some vapours are more difficult to condense than others, and therefore require a longer process."

"The apparatus being thus fixed, the substances to yield the smoke, or vapour, are to be set on fire under the chimney or chimnies, and the machine or machines, set in motion by a steam-engine, horse, water-wheel, &c., the vapours will be drawn from the fires by the action of the machine, and made to pass through the condensing

vessels to be decomposed. There must be apertures at the ends of the condensing vessels, if the pumping machine is placed between them and the chimney, to open and shut, for the purpose of giving vent to the incondensable airs, which will combine with the vapours in burning, and pass with them through the apparatus. If the machine is placed behind the vessels, there will be no occasion for those apertures. In witness, &c."

No drawings are attached to the foregoing specification, and as it contains no description of any arrangements that appear to have been reduced to practice, the information it gives does not extend beyond an explanation of the principle of the operation, which is no doubt feasible, but the economy of it under any modification is very questionable, unless the matters obtained by such modes of condensation shall be of greater marketable value than the cost of the machinery for obtaining them. In our future papers we shall have occasion to make some farther remarks upon this mode of preventing the issue of dense smoke from furnaces.

In 1796 another plan by Mr. William Thomson, of Bow Lane, Cheapside, was published in that truly valuable work, the *Repertory of Arts*, and is the earliest furnace of that construction; which we annex an abbreviated description of.



The above figure represents a longitudinal and vertical section of the furnace, (and consequently of the boiler too, which has two horizontal flues running through it, but not represented in our drawing); *b* the fire place, which must be about one-third longer than they are generally made; *c* an arch which runs across the fire-place, two inches lower than the bottom of the flue under the boiler, and about the middle of the fire place; *e* is the door of the fire-place; which is to have a small shutter in it. Through this shutter the coals must be gently stirred up, by the slice or poker, taking care not to injure the arch, nor to raise too great a quantity of coals at once; *f* is a small space left behind the fire for a current of air to come through; adjoining which, at the extremity of the grate bars, there is a brick placed across the fire-place to prevent the coals from falling over. There are two slides not shown in the drawing, the one to shift backwards, and the other forwards, to make the space *f* for the current of air, larger or smaller, as may by practice be found best.

The operation consists in the arch *c* hindering the smoke from going up the chimney without passing through the fire behind it, which having a strong draught, burns the smoke as it passes through it: the air which comes up through the space *f* being necessary to the complete combustion of it.

To be continued.

METHOD OF CLEARING FEATHERS FROM THEIR ANIMAL OIL.

By MRS. JANE RICHARDSON.

TAKE for every gallon of clean water one pound of quick lime, mix them well together, and, when the undissolved lime is precipitated in fine powder, pour off the clear lime-water for use.

Put the feathers to be cleaned in another tub, and add to them a quantity of the clear lime-water, sufficient to cover the feathers about three inches, when well immersed and stirred about therein.

The feathers when thoroughly moistened will sink down, and should remain in the lime-water three or four days; after which the foul liquor should be separated from them by laying them in a sieve.

The feathers should be afterwards well washed in clean water, and dried upon nets, the meshes of which may be about the fineness of cabbage-nets.

The feathers must be from time to time shaken upon the nets, and as they dry will fall through the meshes, and are to be collected for use.

The admission of air will be serviceable in the drying; the whole process will be completed in about three weeks: after being prepared as above mentioned, they will only require beating, to get rid of the dust, previous to use.

For the communication of the foregoing process to the Society of Arts, Mrs. Richardson was rewarded by the Society of Arts with the sum of twenty guineas.

ON THE EXTRACTION OF POTASH FROM POTATOE TOPS.

TO THE EDITOR.

SIR,—The interesting paper which you gave us in your last N^o. on the farina of potatoes, induces me to draw the attention of your readers, and those of the agricultural class in particular, to the value of the stalks of the plant. It is some years since the discovery was made in France, that the upper portion or "tops" contained so considerable a portion of potash, as to render it a very profitable operation to extract it. The following was stated to be the process observed by the discoverer, who is a druggist at Amiens.

Take off the potatoe-tops the moment that the flowers begin to fall, as that is the period of their greatest vigour; they must be cut off at four or five inches from the ground, with a very sharp knife. Fresh sprouts spring, which not only answer all the purposes of conducting the roots to maturity, but tend to the increase of their size, as the sprouts require less nourishment than the old tops. The tops may be suffered to remain on the ground where cut; in eight or ten days they are sufficiently dry without turning, and may either be carted home or to a corner of the field, where a hole is to be dug in the earth, about 5 feet square and 2 feet deep. Were they burnt with a free admission of the air, the ashes would cool too quickly, and thereby diminish the quantity of alkali. The ashes must be kept red hot as long as possible; when the fire is strong, tops that are only imperfectly dried may be thrown in, and even green ones will then burn well enough.

The ashes taken out of the hole must be put in a vessel, and boiling water be poured upon them, and then the water must be evaporated; for these two operations potatoe tops are to be used as the only fuel of the furnace, and the ashes thus produced, must in their turn be lixiviated like the rest. There remains after the evaporation, a dry saline reddish substance, known in commerce under the head of *salin*; the more the ashes are boiled, the greyer and the more valuable the *salin* becomes. The *salin* must next be calcined in a very hot oven, until the whole mass presents a uniform reddish brown. In cooling it remains dry, and in fragments blueish within, and white on the surface, in which state it takes the name of potash.

The ashes exhausted of their alkaline principle, afford excellent manure for land intended to be planted with potatoes. The following is a table of the results obtained in France.

The number of potatoe plants in an acre is	40,000
Each of these 40,000 plants yield on an average	lbs.
3 lbs. of green tops	120,000
By drying the weight of these tops is reduced to	40,000
This quantity produces of ashes	7,500
The evaporation gives of ashes, exhausted of alkali	5,000
Salin	2,500
The salin loses from 10 to 15 per cent. in calcination, which gives of potash	2,200

By these estimates it appears that upwards of 3000 lbs. of potash may be obtained, in addition to an increased crop, from every acre of potatoes, of a value far exceeding that of the crop itself. The expense of preparing the potash as above described, is about six guineas per acre.* The quantity of land under annual cultivation with potatoes exceeds 500,000 acres in the United Kingdom, which might be made to yield (according to the foregoing calculations) nearly as many tons of potatoes, and this is an amount nearly 50 times that of our annual importation of potash from America! Notwithstanding this flattering view of the subject, it has not fallen to my lot to hear what progress has been made in this country, in the preparation of potash from potatoes, and shall therefore esteem it a favour, if any of your correspondents were to favour us with some information on this subject.

I am, Sir, your obedient Servant,
POTASH.

SOCIETY FOR PREVENTING THE LOSS OF LIFE BY FIRE.

We had the pleasure of attending a meeting of this truly excellent and philanthropic institution, on Thursday last, at No. 18, Aldermanbury, on which occasion there was, likewise, a public exhibition of numerous escapes, as well as models of those machines, which have been submitted to the consideration of the society for their adoption. It was gratifying to observe that the meeting was crowded with respectable people, and that a great degree of active zeal was manifested by the leading members of the society, which augurs most favourably for the successful establishment of it.

In the court-yard in the front of the house a great many experiments were made with those fire-escapes, which, from their convenient portability, were brought there for the purpose; but the more interesting and valuable part of the exhibition consisted of models, the construction and properties of which were consecutively explained by the various inventors of them. The business of the meeting commenced by the unanimous election of THOMAS WRIGHT, Esq., to the chair; the secretary, MR. HUDSON, then shortly stated the plan and objects of the society, and the purpose for which they were then assembled, and invited those gentlemen who had submitted their inventions to the criticism of the society and the public to come forward and explain them.

JASPER ATKINSON, Esq., of the Royal Mint, attended the meeting on behalf of his friend, CAPTAIN MANBY, of Yarmouth, whose genius and enthusiasm, in the saving of human life, has so often been the just theme of public admiration. MR. ATKINSON proceeded to exhibit and explain a variety of models of the Captain's apparatus for the saving of life from *fire*. The first was a small cart, that

* It is very essential to know whether six guineas is the cost of labour per acre in France or in England.—EDIT.

could be conveniently drawn by two men, having on it two boxes, containing various simple contrivances for aiding persons in their descent, such as rope-ladders, which were to be conducted into the window of the house on fire by the throwing in of a ball connected to a line, and thus enable a person inside to draw up and attach the ladder, or other contrivances, for facilitating an escape: to prevent the ladders from taking fire, they were to be soaked in a strong solution of pearlsh, which would render them nearly incombustible: Several other ingenious and simple contrivances of CAPTAIN MANBY's were exhibited, and explained to the meeting (which we are at present prevented from noticing more particularly), and Mr. ATKINSON took occasion to allude to the very numerous valuable lives, which his worthy and scientific friend, the Captain, had been the means of saving from being drowned by his apparatus, amounting to upwards of five hundred! Some of the apparatus used by the Captain for these purposes are identical with those proposed by him for the rescuing of persons from fire, and were equally applicable.

Mr. DAVIS next addressed the meeting on the subject of his invention, and explained its operation by a handsome model; it was constructed 23 years ago, and was the occasion of the SOCIETY OF ARTS bestowing upon him in 1819 their highest reward. A description of this very meritorious contrivance was also published by the Society of Arts, in their volume of "Transactions" for 1810: to which we must refer our readers for want of space here. Considering it as one of the earliest inventions for the purpose, it reflects the highest credit upon Mr. DAVIS, for its completeness and effective operation. The ladders, which are elevated successively, could be varied in height from 15 to 50 feet: the cost of the apparatus was £60. Mr. DAVIS took occasion to show the great advantage that might result from attaching the branch pipe of an engine to the top of his ladders, in order to play horizontally and close into the apartments of a house on fire, the facility with which it might be raised at pleasure to the required altitude, and be variously inclined and directed, according to circumstances, so as to produce the greatest effect; and this, too, at a time when it would be impossible for a fireman to place himself in a situation so advantageous for reducing the conflagration, and even if the desired position were attainable for a moment, still impossible for him to withstand the heat. For this purpose, that end of the branch next to the hose was rendered elastic by an internal spiral spring, and two guy ropes being attached near to the extremity of it, and held by a fireman on each side of the house on fire, enabled them to guide the stream of water from the branch in any direction, with unerring aim, and in the easiest and most secure manner to themselves.

Mr. GREGORY's models, five in number, were next introduced to the notice of the company: they consisted of carriages and platforms, upon which were mounted the ladders, laid horizontally for convenient stowage and transmission, but which were quickly elevated and slid one above another by a very judicious arrangement of the mechanical powers. While we think the highest merit is due to Mr. Davis for

the *originality* and ingenuity of his plans, we must allow that Mr. Gregory has been a great improver of them: but this is only as it ought to be, for Mr. Davis's business is that of a weaver, while Mr. Gregory's is that of a machine ladder maker, which circumstance will account for the superior combinations and greater simplicity which we conceive to belong to Mr. Gregory's machines; the chief of these being described in the Register of Arts, vol. 2, page 136, first series; we shall therefore briefly mention the distinctive features of Mr. Gregory's models.

The first consisted of four sliding ladders with a cradle mounted on a four-wheeled carriage, with adaptations for applying the engine pipes. These ladders ascended 50 feet high: Price 40 guineas.

The second, five sliding ladders on a two-wheel carriage, to rise 34 feet. 16 guineas.

The third, a rope ladder, with cradle complete, to act in a narrow court and confined place. 8 guineas.

The fourth, a cradle to act without a ladder. 5 guineas.

The fifth, a bed room escape with cradle. 3 guineas.

Mr. Hudson, (of Cheapside), the Secretary of the Society, (and we believe we may add, its founder and most active supporter,) next addressed the meeting, in explanation of his own contrivance. Unfortunately at this period our view was obstructed (by the intervention of an Herculean pair of shoulders,) so that we only heard Mr. Hudson shortly and modestly observe that his machine was like Mr. Gregory's, and Mr. Davis's, as regarded the mode of elevating the ladders one above the other, and that it only differed in the manner of altering their inclination, by the introduction of a quadrant and two anti-friction rollers, which regulated their motion, and allowed the ladders to take such a position as to pass under a gateway. Mr. Hudson considered the construction as too apparent to need further elucidation.

The inventor of a singular looking machine was next called, but came not; the secretary therefore very briefly adverted to it, without shewing its action, or explaining its construction. It appeared to be a large sexagonal roller or drum, round which were wound a series of short ladders, each of them being the length of one of the sides. This sexagonal roller was mounted in a suitable frame which formed the bearings of its axis; the ladders as they are successively wound off the roller, pass through a peculiarly constructed frame or guide, which causes their extremities to become securely connected to each other, and directs them in their flight to the window of a house; the uppermost ladder is provided with grappling-irons to take hold of a sill or parapet.

Mr. Hudson next exhibited the invention of a Mr. James, consisting of an iron wire basket or box, which it was proposed to suspend by two chains, to be held by two persons in the adjoining premises, on each side of the house on fire, and by that means to conduct the basket to the window from which persons were desirous of escaping; another chain was attached to the bottom of the basket, to be held by persons in the street, for the purpose of guiding it in its

descent from the flames, or to clear it from projections, or railing in front of the building. This simple contrivance likewise enables the persons managing the suspension chains to land the individual in the basket, in any window of a contiguous house, without descending to the street, which is so excellent a property attending it, that we hope some improvements will be added to it to render it less objectionable in other respects.

A short pause took place at this time in the exhibition and explanation of the models, whilst some arrangements were going forward, which the benevolent chairman took advantage of, by appealing to the good sense and feelings of the company, (in particular addressing himself to the ladies), for their patronage and support.

We find it necessary to make a pause here also. The meeting being held on the day which we usually go to press, precludes our completing our account of the models and experiments made. Those which were exhibited subsequently to those mentioned, possess very great interest; we purpose therefore to describe them particularly in our next, with engravings of several of those which appear to be most deserving of adoption.

We ought not, however, to close our present notice without stating that our contemporary, the *London Mechanics' Magazine*, has, of late, contained numerous excellent papers on the subject of fire-escapes, a great portion of which have emanated from the indefatigable pen of Mr. W. Baddely, Jun., besides some letters of much interest from Mr. Hudson, explaining the formation, objects, and proceedings of this excellent society, all of which our readers who are seeking for information on this subject will do well to peruse.

MISCELLANEOUS INTELLIGENCE.

MUSICAL PRISM.—A novel and ingenious article has just been published, under this title, by Goulding & D'Almaine. Its object is to facilitate to young people the acquisition of the elements of scientific musical knowledge, by employing the aid of the eye and the imagination. It is founded on the well-known analogy subsisting between the seven colours, into which a ray of light is divisible, and the seven notes of the musical scale. By means of this analogy, and by the most simple process, the student is enabled immediately to discover and point out—the mediant, sub-mediant, dominant, and sub-dominant of any given tonic; the common chord of that tonic, and the common chords of its dominant and sub-dominant. So simple, indeed, is the process, that, in other days than these, this invention might have been reproached with having made too “royal a road” within the limits to which it extends. Those who have given attention to the mathematics of music, will also, perhaps, take some interest in these diagrams.—*New Monthly Mag.*

CRYSTALLIZATION OF SULPHATE OF POTASH.—If it be desired to procure very large and regular crystals of neutral sulphate of potash,

it is only necessary to add a little sub-carbonate of potash to the solution of this salt, and then leave it to evaporate spontaneously in a vessel rather greater in width than depth; only one, two, or at most three crystals will be obtained, but they will be of extreme size and beauty.—*Vans Mons, Kastner's Archives*, v. 462.

NEW METHOD OF STOPPING WINE-BOTTLES.—Tie a piece of bladder or parchment over the mouth of the bottle instead of using cork: the wine, says an amateur of great experience, will acquire in a few weeks all the qualities of age, which it would require years to give it on the old system.—*Jour. de Paris*.

VITAL PARTS OF A TREE.—The innermost layers of the bark, and the outermost layers of the wood, are the most vital parts of the stem of a tree, and those on the healthy condition of which the health of the whole plant most immediately depends. Hence many trees continue to exist for centuries when the central part is completely decayed, or even not present, so that the trunk is a hollow cylinder, sometimes of most spacious dimensions.—*Quar. Jour. of Agri.*

WHITE HOOFs IN HORSES.—Even in a wet soil and climate, white hoofs are more brittle and more liable to accident and lameness than black ones; and in the stony and more arid soils and climates, white hoofs do not stand nearly so well, and are much more liable to break and to contract than those of a dark colour; and, in point of fact, horses having white legs and feet do not bring so much money as those of precisely the same description which have them not.—*Id.*

CULTURE OF POTATOES.—Thick planting in potatoes, any more than in trees, is not the way to procure the greatest quantum of fruit on a certain surface. The following is the mode of culture recommended by Mr. C. Hale Jessop, nurseryman, of Cheltenham. Double dig the ground, and, without manuring, plant the potatoes whole, two feet apart each way. When the plants rise, hoe and draw the earth up to them, moulding entirely round each plant, by which mode all have room to swell and bring their tubers to perfection. The soil is not much exhausted by this practice, and the potatoes are easily got at so as to mould them up, even in their last stage of growth. Next pick off the blossoms, a practice which has been proved to add to the produce one ton per acre.

Potatoes may be planted wherever plantations of trees for timber are made, as the spaces between the trees can be profitably used without detriment to them; and from the way the potatoes are moulded round, whatever rain falls in a dry summer is quickly conveyed to the roots of the newly-planted trees, as it runs down the hill of earth containing the potatoes.—*Gardener's Mag.*

ORNAMENTAL CHURCH-YARDS.—Nothing could be easier than to render every country church-yard in Britain an arboretum and herbaceous ground, with all the trees and plants named, provided the clergyman would give up his right to the grass, which with all weeds must be destroyed, and the grave-digger would be content to acquire a very little knowledge of gardening. By laying a burying-ground

out in beds of two graves in width, or about 16 feet, as at Nancy, planting the trees along the walks, and the rows of herbaceous plants across the beds, and parallel to and between the graves, the thing is done.—*Id.*

ATTAR OF ROSES.—Ghazeepore is celebrated throughout India, for the beauty and extent of its rose gardens; the rose fields occupy many hundred acres; the roses are cultivated for distillation, and for making attar. The price of a sieve, or 2 lbs weight (a large quart) of the best rose water, is eight linas, or a shilling. The attar is obtained after the rose-water is made, by setting it out during the night, until sun-rise, in large open vessels exposed to the air, and then skimming off the essential oil which floats on the top. To produce one rupee's weight of attar, 200,000 well-grown roses are required. The juice, even on the spot, is extravagantly dear, a rupee's weight being sold at the bazaar (where it is often adulterated with sandal-wood oil) for 80 s. r., and at the English warehouse for 100 s. r., or 10l. sterling. Mr. Melville, who made some for himself, said he calculated that the rent of the land, and price of utensils, really cost him 5l. for the above quantity.—*Bishop Heber's Narrative.*

ZOOLOGY.—The museum of the Zoological Society has been so rapidly enriched, that it is now stated to contain six hundred species of mammalia, four thousand birds, one thousand reptiles and fishes, one thousand testacea and crustacea, and thirty thousand insects: almost all these are admirably arranged. The vivarium (chiefly in the gardens) possesses upwards of four hundred and thirty quadrupeds and birds. The outlay of the Society last year amounted to 10,000l., the funds being raised by the public admissions to the gardens, and by the contributions derived from a distinguished list of twelve hundred members.—*New Monthly Mag.*

THE PENDULUM.—It is stated in a Plymouth newspaper, that Professor Airy, of Cambridge, has arrived at some new and unexpected results in experiments with the pendulum made in some of the deepest Cornish mines.

FOSSIL TURTLE.—Another of those interesting productions of nature, the fossil organic remains of a sea turtle, has been discovered, and is now in possession of Mr. Deck of Cambridge. It is imbedded in a mass of septaria, weighing upwards of 150 pounds, with two fine specimens of fossil wood, and exhibits, in a most perfect state, this singular animal of a former world, once undoubtedly an inhabitant of our shores. It was obtained in dredging for cement-stone, about five miles from Harwich, in three fathoms water, and, as a mass of stone, had been used for some time as a stepping-block, from which humble station it was accidentally rescued by its possessor for the admiration of the virtuoso.—*Edinburgh Journal of Science.*

SUBTERRANEAN TEMPERATURE.—The results of experiments made at the Observatory of Paris, for ascertaining the increase of temperature on proceeding from the surface of the earth towards the

interior, and which are the only ones from which a numerical expression of the law which this increase follows, may be deduced with certainty, carry to 51 feet, the depth which corresponds to the increase of 1° Fahr. of subterranean heat. Hence it follows, that the temperature of boiling water would only be 8212 feet, or about one-and-a-half miles English, under Paris.—*Edinburgh New Philosophical Journal*.

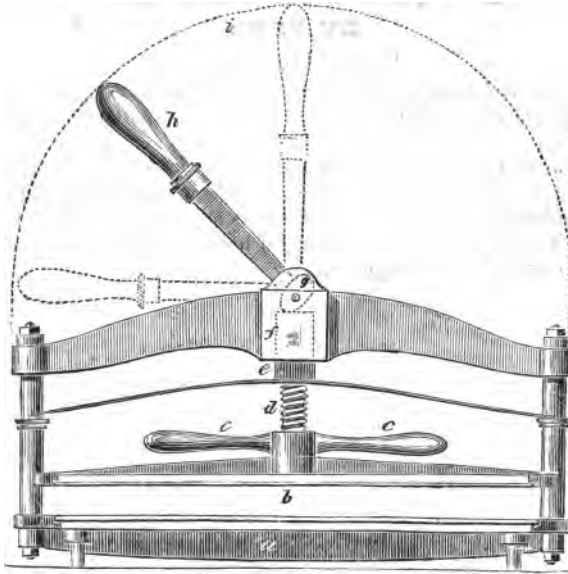
DISCHARGE OF WATER FROM LOCH LOMOND.—Mr. Galbraith gives the following results of his experiments to determine the quantity of water annually discharged by the River Leven from the basin of Loch Lomond. From certain admeasurements made by him, Mr. Galbraith found the discharge to be about 59,939 cubic feet per minute. And as 36 cubic feet of fresh water is very nearly equal to a ton, this gives 1665 tons per minute; and, supposing the year to consist of 365 days, 5 hours, 49 minutes, the annual discharge, at that rate, will be 877,925,085 tons. But as the river was rather below its average height, one-third may be added to this result; and we have about 1,200,000,000 or twelve hundred millions of tons per annum. As extreme accuracy in such computations, unless made daily throughout the year, is not to be expected, the conclusion can only be looked upon as a tolerably close approximation to the truth.—*Journal of Facts*.

ANIMAL BAROMETER.—At Schwetzingen, in the post-house, says the travelling correspondent of the last-mentioned periodical, we witnessed, for the first time, what we have since seen frequently—an amusing application of zoological knowledge, for the purpose of prognosticating the weather. Two frogs, of the species *Rana arborea*, are kept in a crystal jar, about 18 inches high and 6 inches in diameter, with a depth of three or four inches of water at the bottom, and a small ladder reaching to the top of the jar. On the approach of dry weather the frogs mount the ladder; but, when moisture is expected, they descend into the water. These animals are of a bright green, and in their wild state here climb the trees in search of insects, and make a peculiar singing noise before rain. In the jar they get no other food than now and then a fly; one of which, we were assured, would serve a frog for a week, though it will eat from six to twelve in a day, if it can get them. In catching the flies put alive into the jar the frogs display great adroitness.—*Ibid*.

DRAGON FLIES INNOCUOUS.—Nothing can be more absurd, than the fear entertained in England of the larger sorts of dragon flies (*Libellulidæ*), which are branded with the erroneous name of horse-stingers, though the most superficial examination will demonstrate that these insects have not a shadow of a sting: but their jaws are large and strong; not stronger, however, than those of the *Staphylinus*, and not dangerous in the slightest degree, even to infants.—*Ibid*.

TO OUR CORRESPONDENTS.

The Letters of R. N. T.—I. B.—and W. BARRON—are received.

**PATENT COPYING PRESS,**

By MR. RITCHIE, of Edinburgh, 1828.

THE extraordinary mind of the late celebrated Mr. James Watt, was not, as we have lately had occasion to show, solely devoted to improvements in that gigantic power, by which we have been enabled to surpass in manufactures all the nations of the earth; his inventive faculties were employed upon every thing around him. In the art of copying letters, he was the first to apply his knowledge of mechanics and chemistry, and the screw-press which we see in every merchant's counting-house, was his patented invention about forty years ago; since which time no improvement of any consequence has been made in it but that which we have now to describe.

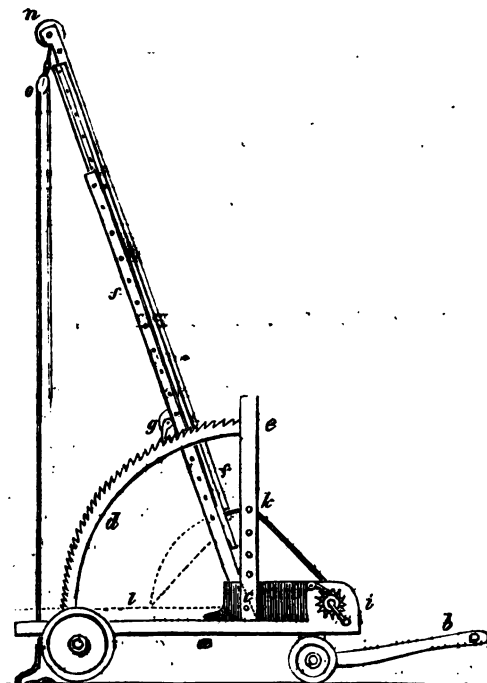
a is the bed of the press; *b* the platen; *c c* handles which revolve on the screw *d*, and are used to draw down the platen upon the paper, &c. placed underneath: *e* is a square piece of steel in which the screw works; the square piece slides in a hole of the same figure on the head of the press, (as shown by dotted lines at *f*;) and on the top of it is a small cam *g* operated upon by the action of a lever *h*. The ordinary pressure is therefore given as usual by the screw, and the cam being subsequently brought down, increases the force almost to infinity through a small space; and consequently by such a press a person exerting only the usual force, can print effectually a larger surface. The other arrangements will be evident upon an inspection of the drawing.

**SOCIETY FOR PREVENTING THE LOSS OF LIFE
BY FIRE.**

Continued from p. 173.

We proceed to complete our account of the meeting of the above Society, and of the fire escapes and models submitted to their consideration.

In our last we took a slight notice of Mr. Hudson's model of a fire-escape; since that time some alterations have been made in it, which so greatly simplify and improve its arrangements, that we have thought it deserving of more particular notice; accordingly, we annex a description of it in this place.



Fire Escape, by MR. HUDSON, of Cheapside.

The diagram represents merely a side view of the apparatus; *a* is the carriage mounted on four wheels, the fore-pair of which are low enough to turn with their axis, and pole or handle under the carriage, for compact stowage, and facility of guiding: *ff* are three ladders lying in grooves one within another, in which they slide, when projected or withdrawn, (they are not shown as extended in the figure on account of the space they would then occupy.) The foot of the lowest ladder is fastened by a hinge joint to a revolving centre, or pivot, in the middle of the floor of the carriage: *d* is an arched frame

forming the quadrant of a circle, with ratchet teeth on one of its edges, in which drops a pall or click *g* on a cross bar fixed on to the back of the lowest ladder; this cross bar rests upon and slides over the smooth edges of the quadrant, the palls and ratchet teeth only operating to prevent the ladders falling back whilst being elevated. The ladders are supposed to lie usually in a horizontal position, as shown by the dotted line *k*. In order to place them in the oblique position for use, they may be elevated by hand, but it is more easily effected by a man at the windlass *i*, round the barrel of which the rope *k* is wound, and the other end of it connected to the ladders, at about three feet above the floor. The ladders being thus brought to the position represented in the diagram, the action of the windlass is continued, which winds off the rope from the ladders, and elevates them successively one above another, until they attain their greatest height. The rope *k* therefore passes through a pulley near the bottom of the lowest ladder, then over the top of it, to the bottom of the next, and then over the top of the same, to the bottom of the upper ladder.

It is deserving of notice in this machine, that by the simple and single action of turning round the winch, the ladders are first brought up in a mass from the horizontal position, are stopped and supported at any required inclination securely, by the palls falling into the teeth of the quadrant; that the continuation of the motion of the windlass then projects the ladders to the required height, and when that is attained, the ratchets on the windlass keep them there, without the necessity of any extra fixings or attachments. Thus the machine, with the exception of the moving force, is almost self-acting; it has only one uniform action; is firmly and steadily supported and secured at every step, and from the simplicity of its combinations, great strength and stability may be ensured without making it too heavy. For these reasons we regard Mr. Hudson's fire-escape as decidedly the best of the ladder kind; we are almost disposed to add—the best kind.

We have omitted to mention that the pivot on which the ladders rest, is for enabling them to be turned round, when it might not be so convenient to turn round the carriage: and that the laying down of the ladders horizontally on the carriage is for enabling the machine to pass under gateways or doorways. There is a roller *n* to relieve the friction when moving up against a wall, and a tackle fall *o* for cars and the usual appendages.

"Expeditious Elevator," or Fire Escape, by MR. JEPSON.

This contrivance was explained by Mr. Jepson, and illustrated by the action of a good model, but we cannot apply the same term of commendation to the machine. This "expeditious elevator" was the "lazy tongs"* awkwardly applied; as they were projected in

* The term given to this combination of levers was applied to them in consequence of *tongs* being first made on the plan intended for gathering fruit; being sometimes used by *lazy persons* to pick up, or reach things at a distance; they ought rather to have been called *pick-up tongs*, since their movements are so quick.

the direction of an inclined plane, but unsupported except towards the lower end, until they struck against the walls of a house. Scuttles and rope ladders were the auxiliaries to be put in request if the expeditions elevator should ever reach its destination. A more happy idea for producing intense friction, and immense weakness, never entered the brain of mortal man.

The next model introduced to the notice of the company was a

Fire Escape, by MR. COHEN, of Hoxton New Town.

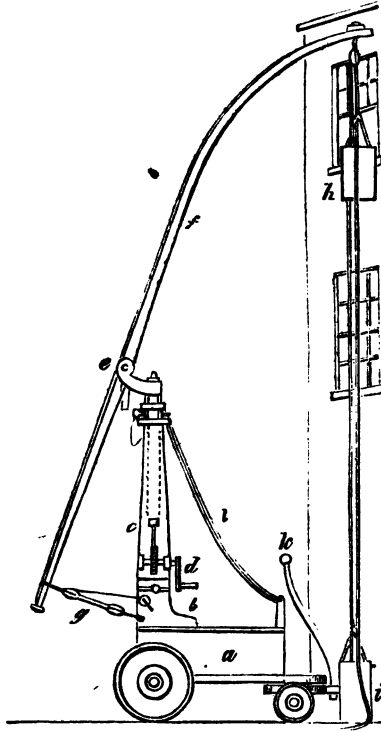
This consisted of a pyramidal frame, supposed to be mounted on the top of an ordinary fire-engine, in such a manner as not to impede or inconvenience the operations of the engine-men with the latter; on the top of the pyramid was fixed a species of universal joint, the upper portion of which consisted of a stout iron ring, embracing about midway a scaffold pole placed in an inclined position; towards the superior end of this pole, and on the upper side were fixed two strong loops or sockets, through which a second pole was passed; and to the furthest extremity of this second pole was suspended a tackle and fall for raising and lowering cars, &c. to afford relief to the besieged. The machine is, therefore, simply a long lever of the first class, on a very secure fulcrum, which being formed of a socket on a universal joint, the power or the range might be increased or diminished at pleasure; it might also, with facility, be posited in any required angle, and a variety of tactics be performed by dexterous hands with it in the hour of peril.

Now if the fire-insurance companies (speaking of them as a body) were as benevolently disposed as Mr. Cohen, some good might be effected by this apparatus, when managed by such clever fellows in their way as the firemen; but if Mr. Cohen expects the acquiescence of the companies to his proposition, we shall say that he knows more of mechanics than he does of this "wicked world."

The next model exhibited we annex a representation of.

Fire Escape, by MR. JOSEPH, of Leman Street, Goodman's Fields.

This invention consisted of a well-constructed carriage *a*, capable of being easily drawn by two men, on which was fixed an elevated part *b*, sustaining a column *c* of wood; inside of this was a smaller column of iron capable of being raised out of it by a rack and pinion, when acted upon by the winch *d*; on the top of this internal column is an iron arm *e* on a swivel, having a cleft at its extremity to receive the long bar or lever *f*, which was fastened to it by a bolt. The lower end of this bar was secured to the carriage by a proper pulley tackle, which admitted of an easy and secure adjustment at pleasure; and to the upper end of this bar was suspended the cars, &c. in the usual manner, with guy ropes therefrom, to be held by persons in the street, to prevent twisting, and to guide the cars *h* and *i* in their ascent and descent: *k* is the handle for drawing the car. There is a small rope ladder at *l*, and a bolt and chain at the top of the column for fixing the internal pillar (which has a range of 8 feet) at the required elevation.



It was proposed by Mr. Joseph (who explained his own invention) that the long bar *f* should be kept detached from the carriage, against the side of a high wall or church, and be laid upon the carriage when proceeding to a fire; the attachment of the bar being only by a bolt is quickly effected. The pillar has a joint near its base, by which it is turned down into the horizontal position whenever required for passing through a doorway, or for travelling.

This is a very respectable and novel contrivance. Mr. Joseph's object appears to have been to get rid of a connected series of ladders; as not to be so fully relied on as a simple bar, which we should like the better if it were straight, being fearful that, in its present curved form, it could not be made sufficiently strong without making it too heavy. But there is an easy way of obviating this objection, which is to truss it on the suspension principle, by which it might be made much lighter, and a vast deal stronger. Some good examples of this mode of trussing has been given in the recent numbers of this work.

MR. DOYLE'S machine was next brought forward, which that gentleman explained the properties and advantages of in a very clear and forcible manner. This model was also on the lazy tongs principle,

and constructed entirely of metal: being put in action by the strong arm of the inventor, the rapidity of its movements, and changes of figure, now darting like lightning to the ceiling, then coming down with a thundering bang upon the table, delighted the audience exceedingly, who testified their admiration by making as great a noise as if the room was on fire, and they were calling out for aid.

It certainly is by no means a singular, but an extraordinary circumstance, that so many persons should have hit upon exactly the same original idea for a fire-escape; we have seen drawings, plans, and models, of at least twenty. The movement is, indeed, the finest in the world for the purpose, and Mr. Doyle has the credit not merely of selecting it, but applying it in the most simple and efficacious way; and as his machine met with such decided approbation, we cannot do less than put a profile of it in this place, more especially as we understand it is to be adopted by the Society.

Reference to engraving.—*a a* represent the combination of levers on one side of the machine; *b* the frame which holds the lower pairs of levers, and wherein the moving force is applied; *c* the carriage on four wheels, and drawn by a handle or pole not shown in the figure; *d* is the stage at the top of the machine, on which a fireman, or other individual, is raised to rescue the persons from the house on fire; at *e* is a folding gangway or bridge, to be projected against, or into the window of a room; at *f* is a tooth pinion; *g* is a toothed quadrant, welded to the lowest lever bar on one side, with its cogs taking into those on the upper side of the pinion; and at *h* is another quadrant, the teeth of which take into the lower side of the pinion: motion being therefore given to the pinion by the winch in its axis, the two quadrants are moved in reverse directions, and the series of levers are simultaneously operated upon in like manner, opening and shutting like so many pairs of shears, thereby drawing them all up closely together, or expanding them to the extent of nearly their united lengths. The drawing exhibits the machine as only expanded to half the height it is capable of being extended.

On the other side of the machine there is, of course, a similar set of levers; they are connected to those described by cross horizontal bars, the ends of which form the pivot joints on which the levers turn. The opposite side of the lower part of the machine is also a counterpart of that represented, and the power is connected by a common axis to the opposite pinions. The very simple movement introduced into this machine, of a pinion working two toothed arcs of circles in contrary directions, was invented by Mr. Doyle, and was justly much admired; but a very little investigation of the action will show it to be defective, and a reference to the work of Lans and Betancourt on the mechanical powers, will shew that it is not quite new. In the work alluded to, this motion is shewn as applied to a pair of shears or pincers, to the opposite limbs of which two toothed quadrants are fixed, and are worked by two toothed pinions placed close together on the same axis,—a uniform and beautiful motion is thus produced, which cannot be by Mr. Doyle's single pinion; because, as the length of the arc of the upper quadrant is less than

that of the lower, the former travels through less space than the latter in the same time, consequently there are two velocities to the quadrants, and only one to the pinion. It follows, that if the teeth of the pinion and quadrant fit each other, the machinery cannot be moved, unless extraordinary force be used, and then breakage must ensue. To scramble over this difficulty with a single pinion, Mr. Doyle will have to set his teeth very wide apart, as in the model; in the latter the friction and back-lashing are of little consequence, but in the large machines which he will construct for the society, those effects will prove highly inconvenient and destructive. The principle of the movement is the best that could be devised for the purpose; and as we highly approve of the choice made by the society of Mr. Doyle's machine, we are solicitous that the ingenious inventor should avoid the error of the single pinion, and substitute two pinions, varying in size in the ratio of the difference between the quadrants.

In 1813 a model of a fire-escape on the lazy tongs principle was presented to the Society of Arts by Mr. Thomas Roberts, of Wardour Street, Soho, who received a pecuniary reward; it was an extremely complex and unfit machine for the purpose: there were four sets of elevating bars, with a staircase of ladders in the inside. The levers on each side of the machine were operated upon by long screws, and each screw moved by the revolution of a pinion, and the four pinions driven by a crown wheel; there were many other parts which rendered it a very absurd machine, however "curious" it might appear. Mr. Roberts seemed to think so too, for he handed subsequently to the Society a drawing of another lazy tongs escape, in which the parts were reduced to less than half. This was also moved by a screw to draw the opposite levers together, the extremities or feet were in consequence put upon rollers, to allow them to run over the floor of the carriage. Mr. Doyle has by his mode of operating produced much greater stability and efficacy by a few simple and excellent combinations.

In the yard adjoining to the room where the meeting was held, and in the view of a great portion of the assembly, a close room was purposely filled with the fumes from burning brimstone, and black coal smoke; into this delightful place marched the right valorous John Dean, equipped with helmet and pipes. The charms of carbonic and sulphuric acid kept him there so long, that the Chairman was induced to occupy a portion of the time in reading the copy of two letters, which Mr. Henry Russell, of St. John Street, had handed to him, respecting the method which he exerted himself in getting adopted for *subduing fires*; by the employment of large force pumps. These letters appeared to be testimonials addressed to Mr. Russell from the proprietors of the Cobourg and Surrey Theatres, respecting the efficacy of their apparatus (furnished by Mr. Russell) which had occasioned the former theatre to reduce its insurance, and the latter to withdraw it altogether. Mr. Dean being repeatedly called, now came out of the black hole as nimbly as a giant refreshed, and striding across the yard, jumped through one of the sash windows, and stood before the astonished people: the ladies shrunk aghast, and well they

might, for he looked not like an inhabitant of the earth, being absolutely half head, and having two long tails streaming from behind it, of some dozen yards in length. A hollow sepulchral voice was now heard to issue from the middle of the head, explaining the mystery of the matter, as we have since been told, but our alarm was so great at the time, that we did not comprehend him: we will, therefore, here describe the device of the thing in our own way.*

MR. GLADWELL now presented himself, with some pretty models of ladders in his hand; and prefaced his description of them by observing, that he considered it desirable to carry simplicity and portability in the construction of apparatus for the saving of life to the utmost possible extent; with that view he had constructed the ladders he then exhibited, which were strong and light, and in short lengths, but were very quickly and securely put together, so as to form a ladder quite as strong as those made in one length, and otherwise well adapted to the object in view. The ladder, when taken to pieces, formed a compact bundle.

MR. WIX, of Stockwell, next addressed the meeting, recommending to their attention his apparatus, which was simply a large sheet of sail canvas, or tarpaulin cloth, of a rectangular figure, strengthened underneath by bands of girth-web, and surrounded on all sides with strong rope loops, forming secure handles, by which the sheet might be held and extended for persons to jump into. This is an improvement upon the old-fashioned plan of saving life, and a very efficient one too; upon such a sheet being held by a sufficient number of persons, who are always collected in a few minutes in populous towns. Mr. Wix appeared to be a sensible, observant, and experienced man, on the subject before the meeting: his proposition was, to have one of those tarpaulins deposited in every watch-house, and to accompany every fire-engine.

A model of an escape, invented by MR. D. MASERES, and improved by MR. B. M. FOSTER, was exhibited and explained by the Secretary; the construction of it escaped our attention, but it was stated to be such that a person might, without other assistance, let himself down from a window in safety, and, if needful, take another in his lap.

Another invention by MR. B. RIDER, of No. 60, Red-Cross Street, Borough, was exhibited. This consisted of a hempen rope, sallied with worsted (like an ordinary domestic bell-rope), and furnished with a spring-swivel ring, by which it could be instantly fixed to a bed-post, or chest of drawers; on the other end was a thimble, for forming a noose, which was to be put round the body under the arms, and by means of a "ramp iron" fixed in a socket on the sill of the window, the person in danger was to lower himself into the street; a "friction seat" was attached to the rope, to enable the person descending to take another in his lap: the price was stated to be from 2½ to 4 guineas.

We have now to describe three inventions, which were experimented with on the outside of the house (wherein the meeting was

* Want of space obliges us to defer this description till our next, when we shall, probably, illustrate it by some drawings.

held), numerous descents being made by them from the upper windows.

LIVET. **COOK'S**, of 127, Long Acre, consisted of a rope attached to one end of the slings of a strong canvas bag, having a circular wooden bottom, and an iron rim at top, to preserve when put in use its cylindrical figure. The other appendages of this apparatus consisted of a block suspended to an iron bolt, to be passed through the brick work just above the window, and a kind of balcony with a trap-door, of a circular shape, through which the bag passes. Thus prepared the rope is passed through the block, and the end of it dropped down to persons on the outside, who are to keep the bag suspended half through the hole in the balcony, so that even children may step in without danger, and be lowered to the ground. At the bottom of the bag is a guy rope, to guide the bag in its descent clear of flames or projections from the wall. When not in use the rope is kept coiled inside the bag, which, when flattened down, lies in a small compass: the prices of this apparatus was stated to be from 2 to 4 guineas.

The next apparatus tried was merely a good corn-sack, with about forty yards of rope strongly attached to it, by sewing round the sack, and forming a sling above; so the bottom of the sack was a cord of sufficient length, to which was fastened a cricket-ball. The cricket-ball being thrown into the window from whence the person is desirous of escaping, he takes hold of the cord, draws up the sack, and passing it round a bed-post (the rope following), he gets into the sack, and turns out of the window; aided by the friction of the rope round the bed-post, and the sill of the window, he can now let himself down comfortably without assistance. In a room having two windows, the rope might go into one, and come out at the other: By this simple means, it is evident, that life might often be saved, as well as valuable property. The cord to which the cricket-ball is attached serves as a guy rope. The efficacy of this apparatus, which is the invention of Mr. Hesse, of Church Street, Stoke Newington, was satisfactorily proved by several trials.

The last apparatus we have to notice was particularly worthy of attention; very numerous descents were made by it with perfect and uniform success, giving great satisfaction to every body present. It is the invention of Mr. DAVID DAVIES, of 15, Wigmore Street, Cavendish Square, and of extreme simplicity: the price is only from 25 to 30 shillings. A long rope is doubled, and the two ends secured to a strong iron ring, for the convenience of being hung upon a hook, to be affixed to the sash frame, or to a joist of the ceiling. Upon this doubled rope are passed several short copper tubes, to each of which is attached externally a strong belt made of girth-web. The other end of the doubled rope is thrown out of the window, which the persons in the street stretch out by holding it taught two or three yards apart. The person about to descend then passes his body into the belt under the arms, the belt being drawn as close as he pleases by a cloth ring; he then precipitates himself from the window in the confidence of gliding down, as pleasantly, and more securely, than he could by the artificial Russian mountains, recently

introduced as a public diversion, and forming precisely the same curve in his descent. There being several belts (any number), the persons may descend one after the other as quickly as they please; and large articles of furniture may be let down by the same convenient and simple means.

Thanks were unanimously voted to the chairman for his zealous and constant attention to the objects of the society, and the meeting separated.

YOUNG'S FIRE ESCAPE.

[To the foregoing account of the meeting of this Society we here add the description of another apparatus, which we think is particularly deserving of attention: it is extracted from the 31st volume of the Transactions of the Society of Arts.]

"SIR,—The many accidental fires, some of which are attended with the most melancholy results, by persons inhabiting the upper apartments (when the fire originates in the lower part of the house) not having the means of saving themselves, have induced me to present the model of a fire escape, which, from the simplicity of its construction, its portability, (as it can be conveyed under the arm of any person with the greatest ease,) and the very trifling expense attending its making, will, I trust, be found deserving of the approbation of the Society.

"This escape is so constructed to be at all times serviceable to the person possessing it, as it can be hooked to the front of the window of his apartments, and he will be able to descend by means of a rope ladder; should his neighbour's house be on fire, and any one in need of assistance, he can raise it to the highest part of the house from the street by fixing the joints at the end of each step together, in the manner of a fishing rod, beginning with the hook which is to be placed in the socket of the top step, the other end of the top step to be placed in the socket of the one beneath it, and the same with every other step, which will form as it were a small rod, which may be rested against the wall of the house, by the side of the window, where the person in danger is, who will place the hooks properly, which are made sufficiently large to embrace the thickness of the wall, then, by pulling the ropes at the bottom, each step will be drawn from the socket of the other, and the ladder will be formed. The ropes at the bottom will enable persons in the street to steady the escape, and keep it from the wall.

"If, Sir, you will have the goodness to present it to the Committee, at the earliest meeting, you will much oblige, Sir,

"Your obedient Servant,

"No. 10, Bury Street, Bloomsbury,

"April 21, 1813.

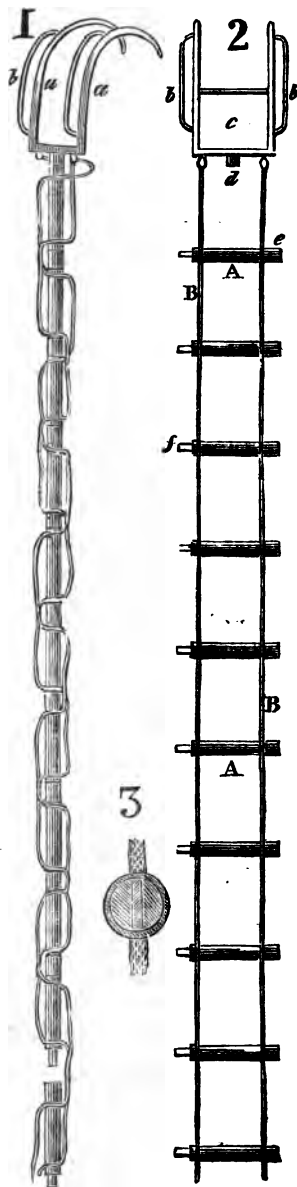
"ADAM YOUNG, JUN.

"To C. TAYLOR, M. D. Sec.

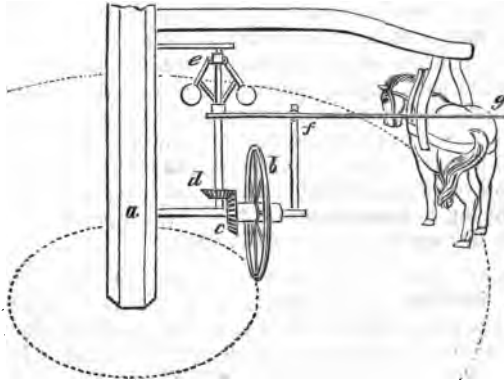
"*Reference to the Engraving.*—This ingenious contrivance consists of a number of rounds, A, fig. 2, forming the steps of the ladder by being united with two ropes BB, which are suspended from an

iron frame C, terminating in hooks *a*, which can very conveniently be lodged on the sill of a window, and thus form a convenient ascent, (as is shown in fig. 2;) being very nearly the same as the common rope ladders used on board a ship; the principal part of the contrivance consists in making the ladder, so that the rounds can be put together in the manner of fig. 1, forming a pole, by which the frame *c* can be raised up to the window from below; to effect this, the ends *e* of the rounds A have ferrels fitted fast upon them, and the other ends *f* are reduced so as to enter the cavities of the ferrels, which project beyond the end of the wood so as to form sockets for their reception: the iron frame *c* at the top has a projecting pin *d*, which is connected with the end socket *e*, of the upper round, thus fixing it at the top of it; the small end of this is inserted into the ferrel of the second, which is again fixed at the top of the third, and so on to the bottom, thus a pole is formed as in fig. 1, of all the staves of the ladder united together; by this, the hooks *a a*, at the top of the iron frame, may be raised up to a window sill, and then a single jerk or pull at the lower end, disunites the staves from one another, and they assume the form of fig. 2, ready for ascending or descending.

"The ropes B B of the ladder are composed of three small lines plaited together, which method gives the means of fastening the staves very securely to them; this is shown by fig. 3; a hole is bored through the stave at the place where the rope is to be fixed, large enough to receive one of the three lines, and a groove is turned round outside of it at the same place; then one of the lines are passed through this hole; and the other two passed round in the grooves on sides so as to surround the stave, then all the three being plaited together, make as firm a connection as possible



"The frame C at the top has two iron rods *b b*, fixed to its sides, which are useful as hand rails to a person getting out of a window upon the ladder; this frame, though large, does not take up any room when the ladder is packed up, because all the staves laid are parallel and rolled up into a bundle, which fits into the curved inside of the frame C, and the whole is tied together by two lines fixed to the ends of the ladder, which serve also to guide and keep it free from the area, rails, &c. of any house."



MECHANICAL MILL - HORSE DRIVER.

TO THE EDITOR.

SIR,—It has often occurred to me that a simple apparatus might be constructed to obviate the necessity of employing a boy to drive a mill-horse, and at the same time maintain a more uniform speed, so essential to the efficacious operation of machinery. My proposition is to introduce an ordinary steam engine governor, in some convenient situation, and so arranged, that when the horse reduces his speed below the required velocity, he shall *whip himself*. Having given the hint, the mechanician will at once see its practicability in various ways; but as all your readers may not see the matter equally clear, I send for them a little diagram in perspective, which exhibits one obvious method by which their dobbins may be made to prevent themselves from going to sleep.

a is the central shaft of the mill; the revolution of which gives motion to a light wheel *b*, upon the axis of which is a bevelled tooth wheel *c*, which turns the pinion *d* on the spindle of the governor *e*; when the balls collapse by the reduced centrifugal force, the lower collar acts upon one end of a long lever, (which has its fulcrum at *f*) and raises the other end *g*.*

I remain, &c.

A CONSTANT READER.

* Our Correspondent has omitted to finish his drawing; but it affords hints by which the intended operation may be effected.—EDIT.

MISCELLANEOUS INTELLIGENCE.

FUSION OF PLATINUM.—The process pointed out by Dr. Wollaston, for the fusion of platinum, is, instead of alloying, to purify the platinum from every admixture by solution, consolidating its precipitate by pressure, by heating, and by percussion, so as to effect a complete welding of the mass, thus made capable of being rolled into leaf, or drawn into wire of a tenacity intermediate between those of iron and gold. Before the discovery of Dr. Wollaston, the qualities of platinum were withheld from chemists, by its resisting fusion in the most intense heat of our wind furnaces. Alloyed, indeed, with arsenic, it becomes susceptible of receiving ornamental forms; but a continued heat expels the volatile metal, and leaves the other in a state wholly unfit for use. The material has now become not only of high importance to refined chemistry, but is actually employed in the largest manufactories for distilling an article of commerce so abundant and so cheap as sulphuric acid; and has mainly contributed to the producing a new species of glass, which promises to form an epoch in the history of optics.—*Phil. Mag.*

DANGER OF ARTIFICIAL INFLATION OF THE LUNGS.—The practice of artificial inflation of the lungs, as a means of recovery from drowning, has been objected to before the Académie des Sciences, on the strength of experiments made by M. Leroy d'Etortes, on various animals, especially on sheep, which are stated to prove, that the practice is attended with great danger, and that a strong inflation is capable of producing instant death, although some animals are better able to bear the process than others, a dog, for instance, than a sheep, on account of the stronger texture of the lungs. The experimentalist infers, that the number of persons restored to life from drowning, is less than it would be, but for the use of inflation as a remedy for their recovery.—*Journal of Facts.*

YELLOW FEVER.—Of more than five hundred competent practitioners, only forty-eight are in favour of the contagiousness of the yellow fever, four hundred and eighty-three being decidedly against it. In those parts of America where it most frequently rages nobody believes in contagion—the extension of the disease seems entirely owing to the atmospheric constitution, and to local causes; the latter consist, partly, in putrid effluvia. There exists, in no case, a clear proof of contagion having taken place, and all assertions to the contrary are founded either on false testimonies, on defective observations, or on erroneous inferences from correct observations.—*New Monthly Magazine.*

ELECTRICITY.—An important fact has lately been ascertained with reference to electricity. It is well known, that if the two poles of a voltaic pile are united by a short metal wire, a proper charge will make that wire red-hot in the middle. Philosophers have explained this by stating that the temperature of the wire was actually the same throughout; but that the extremities feeling the cooling

effect of their contact with the pile, it followed that the middle must manifest a higher temperature. Experiments have, however, been recently made on the operation of the electrical current on a wire so long as to remove the possibility of any cooling effect on the extremities interfering with the result. By those experiments it distinctly appears that the temperature of the wire goes on augmenting from each end of the wire to the middle; and, consequently, that the cause which produced an electrical current, the intensity of which is uniform in every part of the wire, acts as an accelerating power in the development of heat.—*Ibid.*

DEGREE CONFERRED ON A FEMALE.—The medical faculty of Marienburg has conferred the degree of M. D. on the widow Boivin, head nurse and directress of the hospital of the Faubourg St. Denis, at Paris, the authoress of a clever work on midwifery, and other writings.—*Ibid.*

FORMATION OF AMBER.—M. Berzelius, the Swedish naturalist, adopts the opinion that amber is of vegetable origin; that, like ordinary resins, it has flowed from vegetables in the state of a balm, and has afterwards acquired hardness gradually. "Amber," he says, "contains five substances: 1, An odoriferous oil, in small quantity; 2, A yellowish resin intimately combined with this oil, dissolving freely in alcohol, ether, and alkalis; very fusible; and resembling ordinary vegetable resins; 3, A resin soluble with difficulty in cold alcohol, more freely in hot alcohol, from which it separates on cooling as a white powder soluble in ether and alkalis. These two resins and the volatile oil, if removed from amber by ether, and then obtained by evaporation of the latter on water, form a natural viscid balm, very odorous, of a clear yellow colour, and which gradually becomes hard, but retaining some odour. There is every reason for supposing this to be precisely the substance from which amber originates; but at the same time rather poorer in essential oil than at first, and that the insoluble substances in amber have been gradually formed by a spontaneous alteration of this balm; but at the same time have developed one part of it; and so preserved it from entire decomposition or change. 4, Succinic acid dissolved with the preceding bodies by ether, alcohol, and alkalis; 5, A body insoluble in alcohol, ether, and alkalis, and analogous in some points to the substance found by M. John in gum-lac, and called by him the principle of lac. This is formed in large quantity when a solution of gum-lac in alkali is precipitated by chlorine.—*Annalen der Physik.*

PROPAGATION OF FLEAS—THEIR MUSCULAR STRENGTH.—Fleas breed and undergo their metamorphosis in a manner somewhat similar to the silk-worm. A number of eggs being collected from a dog, and put into a pill-box, in a few days produced hairy caterpillars, which were fed with dead flies, and which the caterpillars ate in a very voracious manner. It was observed, occasionally, that they cast their skins; and in about ten days after their exclusion from the egg, they span and wove themselves little cases after the manner of

silk-worms, in which they remained enclosed in the chrysalis state about nine days, and then came forth perfect fleas, armed with sufficient powers to disturb the rest, or even the peace of an emperor!

The muscular power of the flea is almost beyond belief. Latraille mentions a circumstance of a flea of a moderate size dragging a silver cannon, mounted on wheels, that was twenty-four times its own weight; and which being charged with powder, was fired, without the flea being at all alarmed. Socrates appears to have measured the leap of a flea, and found it extended to two hundred and fifty times its own length; a most astonishing leap! It was as if a man of ordinary stature should be able at once to vault through the air to the distance of a quarter of a mile!—*Techonolog. Repository.*

BARRENNESS OF FRUIT TREES.—The Bath and West of England Society have offered a premium of 10*l.* “to the person who in the year 1831 shall give the most satisfactory account of the cause and cure of barrenness in fruit trees, including a practical examination of the opinions and experiments which have been published by Mr. Lyon on the subject of barking trees as a remedy for this defect.”—*Cheltenham Jour.*

LIST OF PATENTS

That Expire in the present Month of February, 1829.

SPINNING.—To John Wood, of Manchester, for certain improvements in machinery, and for preparing and spinning cotton. Dated February 4, 1815.

LOOMS.—To J. and P. Taylor, of Manchester, for improvements in looms for weaving various substances. Dated February 4, 1815.

PRINTING CLOTH.—To James Thompson, of Clitheroe, Lancashire, for improvements in the process of printing cloth. Dated February 4, 1815.

TOAST-STAND.—To William Griffiths, of Giltspur Street, London, for an improved toast-stand. Dated February 7, 1815.

ROOFS.—To R. J. Tomlinson, of Bristol, for improvements in the construction of roofs. Dated February 9, 1815.

EVAPORATION.—To William Moul, of Bedford Square, for a mode of evaporation and sublimation. Dated February 13, 1815.

SHEARING CLOTH.—To Jonah Dyer, of Wootton-under-Edge, Gloucester, for an improved machine for shearing woollen cloth. Dated February 21, 1815.

CARRIAGES.—To Joseph Burrell, of Thetford, for a support and safeguard in getting in and out of carriages. Dated February 21, 1815.

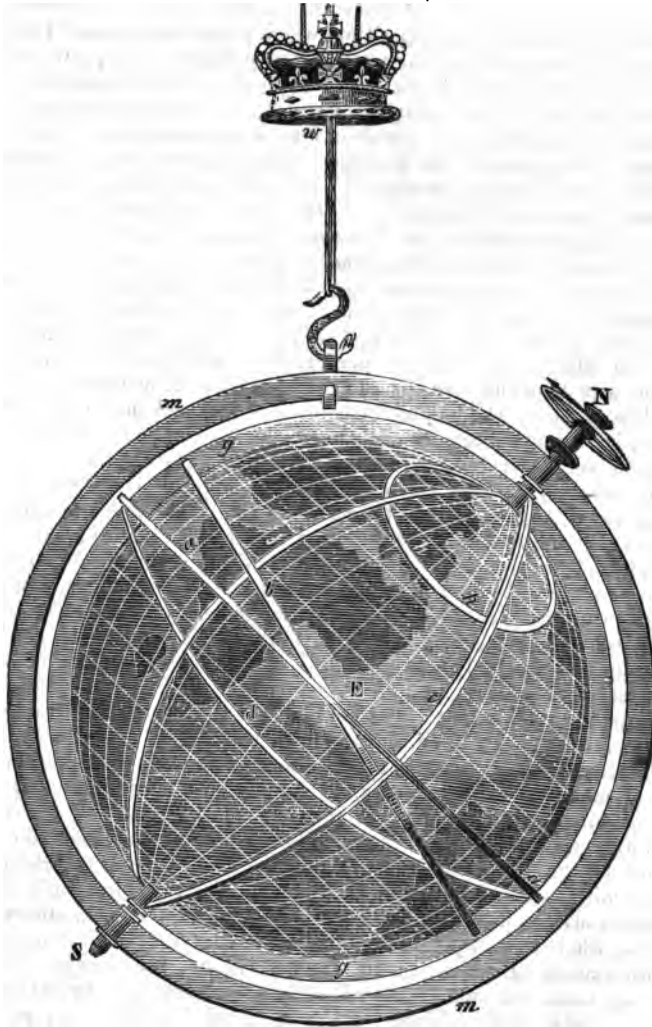
LOCOMOTIVE ENGINES.—To R. Dodd and G. Stephenson, of Killingworth, Northumberland, for improvements in locomotive engines. Dated February 28, 1815.

RUDDER.—To S. Brown, of Mark Lane, for a new construction of rudder and apparatus connected therewith. Dated February 28, 1815.

TO OUR CORRESPONDENTS.

In reply to R. N. T. we have no hesitation in stating it as our opinion, that his object should be to force into the cupola the largest quantity of air in a given time; and that a moderate velocity given to the current is preferable to a great velocity. An advantage will also be found to result by leaving a space between the tuyere pipe and the aperture, as a quantity of the surrounding air is thereby forced into the furnace along with that from the bellows. If we do answer his other queries, we will insert them for the notice of our readers.

I. B.'s Letter is not quite intelligible.—W. S. will appear soon.



(Dr. Muller's Patent CosmospHERE.)

NATIONAL REPOSITORY.

THE SECOND annual Exhibition of this useful Institution was opened to the public on the 1st of this month, with a collection of articles, for the most part of superior merit to those exhibited last year; affording thereby the gratifying assurance of the ultimate

VOL. III.—NO. 61.

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10 MAR. 1839.

accomplishment of the disinterested designs of its founders, notwithstanding the ungracious opposition which it has experienced from a certain portion of the public press. The patriotic attempt to bring to a focus examples of the skill and ingenuity of British mechanics, with a view to their encouragement and protection, has been decried as not only useless, but pernicious in its consequences; and the Editor of the chief of the journals alluded to, concludes his objections in the following words: "*The public will always be found the best patron of the useful arts; the consumer the best judge; the shops of a great city the best 'National Repository'; and a ready sale, with prompt payment, the best premium of encouragement.*"

Now these are the maxims upon which the Times founds its objections; yet what do they amount to? Is it not the avowed and evident object of the founders and supporters of the National Repository to enable the public to become more efficient patrons of the useful arts than they are, or can possibly become, without such an establishment? The humble inventor of a new and useful improvement, has hitherto been generally compelled to confine the knowledge of it to the contracted circle of his own immediate connection, who have, probably, neither the means nor the opportunity of assisting him; and if, as is sometimes the case, the invention obtains publicity, it generally follows, that the capitalist succeeds in obtaining both the honour and the profit. The National Repository will go far to remedy this evil; there the poor man may exhibit his production, and obtain a patron in the wealthy or the patriotic, instead of remaining neglected or unknown, or seeing the result of his labour and genius appropriated to the benefit of others, without his partaking of the slightest portion of it.

The observation that "the consumer is the best judge," might lead persons unacquainted with the facts of the case, to suppose, that the National Repository was a store room for the sale of the common run of manufactured articles, and this inference is strengthened by the subjoined observation, that "the shops of a great city are the best national repository." Now, will the editor of the Times condescend to inform us, who are the consumers of suspension bridges, water mills, steam boats, and such like things, that form such conspicuous articles in the Gallery? and will he next have the kindness to tell us, where that shop is to be found which contains the most modern improvements on ships, steam engines, masts, fire escapes, pile-driving machines, and a hundred other new mechanical inventions, which render these objects in the National Repository so many lessons of practical value to the mechanician, and so many subjects for the study and delight of the philosopher? let us inquire also, where is that shop in which a peculiar interest or prejudice does not often form a barrier against the introduction of many novel and valuable products of industry, or ingenuity? The "Repository" does not invade the province of the shop-keeper; on the contrary, it is the medium of making known improved productions, or inventions, enabling the public afterwards to procure them of the shop-keeper: a limited capital; or the risk of its misapplication deters the shop-keeper frequently from encouraging a novel improvement in manufactures;

but the publicity and patronage obtained by its exhibition in the Repository removes the difficulty, and *throws open the doors of every respectable shop in the kingdom for its reception.*

The Times has asserted, that sufficient means exist to give publicity to every invention, through the ordinary channels of information; if this were the case, we confess it would form an argument against the Repository. Now publicity can only be given, and attention drawn, by a large expenditure of time and money; two items, by the bye, with which the poor man is very scantily furnished, but who may now make his invention known, *without expense* or loss of time, through the medium of the Repository, and be assured of patronage or encouragement proportioned to its merit.

Of this fact we could adduce numerous instances, proving indisputably, the great advantages and benefits that must result both to the public and the individual exhibitor; but we need not go beyond our own individual case. As the editor of this publication, we possess greater means than persons in *ordinary*, of calling public attention to any favourite scheme of our own that we may have; yet we will unreservedly state, that since we sent a little rude model, representing the principle of our new mode of boring the earth, to the National Repository, that we have had more inquiries about it in the short space of four months, than we had previously in the space of four years, (that being about the period since we published a description of it in our work). The cause of this is obvious; the interesting collection in the Gallery draws together a great number of visitors who have a taste for improvements in the arts; and many of these visitors are men of property, who take a delight in giving encouragement to new and useful schemes; and who not having any private interest or prejudice to operate against them, their introduction is materially facilitated, and the inventors get recompensed for their labour or study.

We have now left only one of the points unnoticed, on which the Times takes its stand, which is, that "a ready sale, with prompt payment, is the best premium of encouragement." Now this cannot be obtained of the shopkeeper who has not the goods to sell; who does not purchase at all improvements in machinery, much less, such as are of a problematical character, which is the case with all untried propositions. Neither does the shopkeeper purchase *designs* in architecture and engineering: in fact, such things are not for sale at all, but are placed there by the projectors for the patronage of the public, while they serve the purpose of instruction to the inquiring mind.

We have only room to make another observation, which is, that these attempts to *write down* the "National Repository" will certainly have a contrary effect with every intelligent mechanic, for it will induce a public discussion of its merits and advantages, which is the very thing wanting to *ensure permanency* to the Institution.

As it is our regular duty to give descriptions of every mechanical invention as soon as it shows itself in a tangible form, it follows that a large portion of the subjects of every annual exhibition of mechanism will have been previously described in our pages. Wherever this

occurs in our account of the present contents of the National Repository, we shall of course only make a reference, with such additional remarks as the subject may call forth. As we intend to classify the subjects, we commence with the

MACHINES, APPARATUS, & IMPLEMENTS.

N^o. 1. & 2. *The Patent Cosmospherically-mounted Globes, by Major Muller, G. L.*—While numerous important improvements have been made in the delineation of places on the terrestrial, and constellations on the celestial globes, which are now brought to a state of great correctness and beauty, little or no attention has been paid to the improvement of their appendages since the days of Ferguson: for we still have them surrounded by a clumsy wooden circle, which is absurdly denominated an horizon. We say absurdly, for when applied to the terrestrial globe, it can only represent the horizon of a place while the globe is at rest, and when applied to the celestial globe, it is better calculated to illustrate the erroneous notions of Ptolemy than the true system taught by Newton and subsequent astronomers. We have been naturally led into these remarks by observing the *revolutionary* alteration which Major Muller has introduced in the structure of the celestial, and in the mounting of terrestrial globes. He has ingeniously combined the two, and obtained a patent for the invention, which he denominates a Cosmosphere.

This celestial globe consists of a hollow glass sphere, on which are depicted the stars constituting the various constellations. This sphere is furnished with brass circles representing the equinoxial, the ecliptic, the colures, and the polar circles. The glass sphere separates at the equinoxial into two hemispheres, for the purpose of admitting within it a terrestrial globe, which is manufactured in the usual way. This globe is also furnished with brass circles, which are adjustable to represent at pleasure the meridian and the horizon of any assigned place. The axis of the globe passes through the sphere, and supports both in a strong brass ring, which may be either attached to a stand and made to rest upon a table, or suspended from the ceiling of a room, with a counterpoise *w* (as we have represented it in our engraving) which will render clear the structure of the apparatus, when compared with the following references.

a a represents the equinoxials, where the two hemispherical glasses *g g* are united, and from which the declination of stars is to be measured; *c* represents one of the colures, and *f* one of the terrestrial meridians; *h* represents one of the polar circles, and *m m* the large brass circle or general meridian, in which the apparatus is suspended by the poles *N* and *S*.

By the cosmosphere, as we have described it, the position of the earth with respect to the fixed stars may be represented at any given time; and by placing on the celestial sphere patches to represent positions of the sun, moon, and planets, the position of the earth with respect to these bodies may also be represented with facility. Hence many of the astronomical phenomena arising from the position of the earth with regard to the other bodies can be familiarly illustrated;

and numerous useful problems readily solved by the *cosmosphere* in this form. But to extend its usefulness to other illustrations and solutions, the patentee has made arrangements for removing the globe from the interior of the sphere, and placing in its stead the sun with the planetary system; and by this means the relative positions of the planetary bodies may be interestingly represented. He has likewise provided brass graduated circles, by which, when they are attached to the celestial sphere, the nature of the various astronomical and nautical problems depending on spherical trigonometry may be pleasingly explained.

The construction of this apparatus, enveloped in a sphere of glass, and mounted in so curious and novel a manner, forms a singularly beautiful and interesting object. The patentee has, we observe, written two Treatises on these compound instruments, which are published by Richardson, of 23, Cornhill, and are intended for self-instruction and the use of schools. By these works we perceive that the ingenious patentee, who lives chiefly in Hanover, (where he holds a high civil as well as military post) proposes to sell a part of his patent-right.

3. *The Inverted Spring Pendulum, invented by Mr. W. Hardy, of Wood Street, Clerkenwell.*

The object of this invention is to ascertain the stability of the support of clocks, for which purpose the weight at its upper extremity is screwed down, until it will perform its vibrations in the same period of time as the pendulum of the clock. The inventor states that when the weight *a* is screwed up to the top of the steel rod *b*, it vibrates only once in 8 or 9 seconds, which renders it remarkably susceptible; and that its sensibility is so great, that the attraction of the sun and moon, or of mountains, may be observed by it. It serves also for ascertaining the stability of buildings.

a is the weight screwed upon a steel rod *b*, which is supported at bottom by a small piece of steel watch spring *c*, and contained in a glass tube; *d* is a cap or stopper to the upper end of the tube, and carrying underneath a small graduated scale, over which ranges the index at the top of the weight.



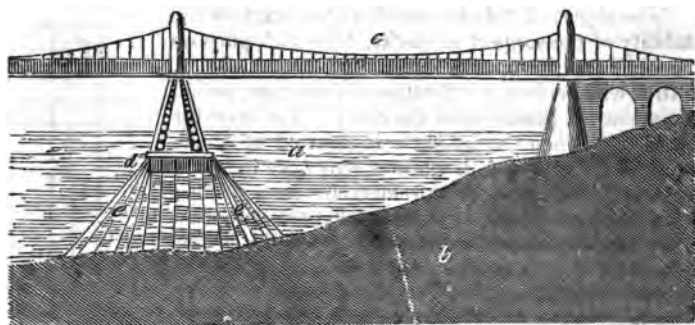
4. *Bright's Shadowless Lamp.*—Since we described this excellent invention, and its internal construction, at page 200 in our last volume, the external appearance has been improved by the introduction of classical taste into the design.

5. *Model of a Suspension Bridge, invented by J. P. De la Fons, of George Street, Hanover Square.*—In the second volume of the present series of this work, page 182, is given the substance of the

specification of the patent of Messrs. De la Foa and Littlewort, "for improved methods of mooring ships and other floating bodies," which embraced a novel and very ingenious method of driving piles under water; but it does not appear from that document that the patentees had then conceived the idea of applying their invention to the construction of bridges; the model sent in to the Repository, however, affords evidence of its admirable adaptation to that useful species of architecture.

The method of constructing bridges thus suggested is perfectly new; and to our judgment it is one that will prove of great public utility in situations where the water is too deep for the erection of piers, and where the expanse of water is too great to be passed over by single chains, without other support than is afforded at the abutments.

To give a correct representation of the model in the Repository, by an engraving, would take up a greater space than we can very well spare; and as we do not doubt that most of our readers, who take an interest in subjects of this nature, will avail themselves of the present opportunity of inspecting the original, we shall delineate only a portion of it, which being from memory is not strictly accurate in its proportions, but is, nevertheless, correct in principle.



a represents the river or channel to be crossed; *b* the bed of the same; *c* the suspension bridge; *d* one of the floating piers, of which there may be any required number, according to the distance between the shores; *e* the mooring chains, which are attached to the heads of piles driven perpendicularly into the earth.

The piers are supported upon rows of properly constructed boats, whose buoyancy is sufficient to bear the weight: that is, without their being submerged by the pressure when the tide falls to its lowest point, and the boats are confined in this situation by the mooring chains, which are attached to the heads of the piles sunk perpendicularly into the earth. By this arrangement, when the tide rises, the piers cannot ascend and lift the bridge, which would be the case were the boats not tied down to the extreme point of low water, while the bridge is supported by their buoyancy in either case. It is likewise deserving of notice, that the mooring chains being fixed in an

oblique direction to the piles, cause a lateral pressure of the piles against the earth, and consequently enable them to resist a much greater strain than has hitherto been obtained in similar works under water.

The machinery and process by which the piles are driven at considerable depths under water, have been already described by us where referred to; and we shall probably soon have occasion to make some further remarks upon this subject, as we observe that a large model of the patentee's apparatus for this purpose is exhibited in the Gallery.

6 & 7. *Models of Paddles on an improved plan, by I. L. Stevens, Esq.*—By the improved arrangement each throw of the crank carries but one paddle. (see pages 270 to 344, last volume.)

8. *Lieut. Shulldham's Revolving Masts.*—Described page 328.

9 & 10. *Models of apparatus upon a new principle, for shortening the process, and materially diminishing the labour and expense of boring the earth, for water or minerals, by L. Hebert.*

11. *Lever Cramp for Laying Floors, by A. Smith.*—This invention is fully described at page 235, last volume.

12. *Model of Metallic Shutters and Sun Blinds, by Thomas Den, of Holland Street, Blackfriars.*—At page 289, vol. II. N. S. is given a very full account of this invention; and it has since undergone some important improvement which we propose to ourselves to describe at the earliest opportunity.

13. & 14. *Models of Patent Refrigeratories, by I. Wheeler, of Queen Street, Cheapside.*—These excellent inventions have been fully described at page 227 of our last volume; but we may here add with propriety, that their dimensions are so small when compared to their refrigerating powers, that it is calculated a refrigerator capable of cooling 40 barrels per hour, only occupies a space of 4 feet wide and 2 feet deep; a condenser, to work a 2000-gallon still, a depth of only 5 feet, by a breadth of 3; and one for working a 30-gallon, only 6 inches by 6.

21. *Improved Parasol, by Crawford, of 28, Cheapside,* covered with the diaphane silk which has some resemblance to silk lace, and presents to the eye beautiful designs, seen through a coloured lining, which renders the parasol impervious to the rays of the sun.

23. *Patent improved Umbrella Frames, manufactured by T. H. Caney.*—As umbrellas are of such frequent and extensive use, every improvement of them is deserving of attention; that which we have

to notice is particularly so, being calculated to improve their action, and to render them much more *durable* than they usually are, without increasing the weight, or materially adding to the cost.

In frames of the usual construction, the ends of the whalebone are connected to the top of the umbrella by means of a *ring* of wire, and the ends of the stretchers are in like manner jointed to the sliding tube, which is of course a very unmechanical arrangement, however cheap and easy of execution it may be; as the axis on which the ends turn, is thereby produced of the form of a circular arc, instead of a straight line; and the friction is in consequence so excessive and unequal, as to ensure speedy destruction to those essential parts of the machine. In the old frames it will likewise be observed, that the stretchers are connected to the middle of each whalebone, by pins passing through the latter; the holes for these pins of course weaken the whalebones exceedingly, and the subsequent wear of these parts reduces their thickness so much, that they are frequently breaking, and the repairs required from one cause or other, are almost incessant, and are the source of much inconvenience in rainy weather.

To obviate these defects, each whalebone in Mr. Caney's umbrellas is connected to the top by separate straight axes, and in such a manner that they cannot shift themselves out of their places; the stretchers on the sliding tube are connected in the same way to the sliding tube; and the stretchers are jointed to the whalebones without perforating the latter, as will be understood by reference to the annexed figures.

Fig. 1 shows one of the ends *a* of the whalebones, *b* the ferrule on it, with a pin *c* passing through its jointed end.

Fig. 2 shows a plan of the brass plates, *d* being a plate to which the whalebones are jointed; *e* is the aperture through which the umbrella stick passes; *c* denotes the pins passing through the joints,

Fig. 2.

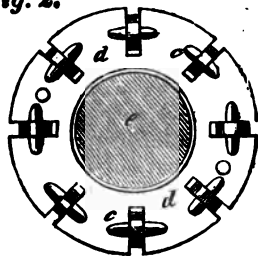


Fig. 3.

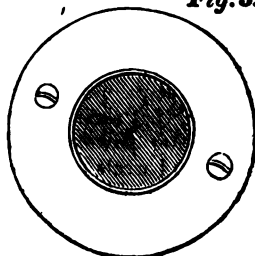


Fig. 1.

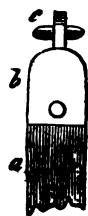
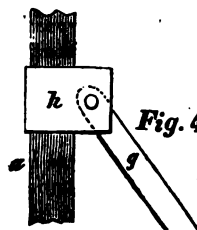


Fig. 5.



Fig. 4.



and lying embedded in cavities in the plate, wherein they are confined by the screwing on of the top brass plate, shown by fig. 3.

The stretchers being jointed to the sliding tube in the same manner as before mentioned, it will be unnecessary to show the plan of it.

Fig. 4 *a* is one of the eight whalebones; *b* a ferrule made by the doubling of sheet brass round it, to receive the pin or axis of the stretcher *g*, without impairing the whalebone; and the manner of doing this is shown by the transverse section in fig. 5, in which the same letters of reference indicate similar parts, as are already described.

24. Is a specimen of a square-shaped Umbrella, made also by Mr. Caney, of a very large size, adapted to travelling on the outside of vehicles. In this apparatus there are several distinct series of stretchers, upon different sliders, and of the various lengths necessary to support the angular covering.

26. *A Triennial Time-piece, by Pace, of Bury St. Edmunds.*—This is a very beautiful and necessarily complex piece of mechanism. In this clock Mr. Pace has attempted to apply the impulsive power of the spring, for a longer period than has hitherto been done. Besides the hours and the days of the month, it indicates the number of years and weeks since it was last wound up. We shall *probably* give a more enlarged description of this machine at a future period.

27. *New Detached Alarm Watch, manufactured by Harvey & Co.*—This was the patented invention of Mr. J. A. Berrollas, and is minutely described in vol. i. N. S. of this work, accompanied with illustrative engravings of every part of the mechanism.

28. *Self-registering Stamp Press, by John Reilly, of Finsbury Place.*—This is a small screw fly-press, having on the under side of the upper die a small projecting pin, which being forced back at every stroke of the press, acts upon ratchet work or other suitable movements, enclosed in a small case above, and having in front a dial, which registers the successive movements with undeviating accuracy to the extent of 20,000, without requiring winding up. The dial in this machine is left uncovered for the purpose of inspection, but when in actual use it is covered in such a manner as to secure it from all interposition on the part of those employed in stamping. The object of the invention is stated by Mr. Reilly to be, the prevention of frauds in the Stamp Office, which according to the 14th Report of the Commissioners of Inquiry into the Revenue have been very frequent.

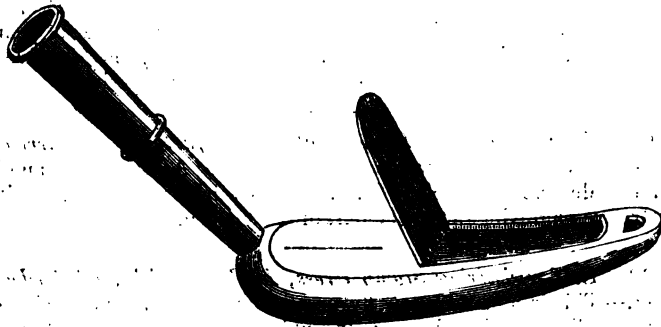
29. *Improved Key Tooth Extractor, invented by G. R. Shene, of 6, Jermyn Street.*—Our knowledge in tooth-drawing instruments is perhaps not sufficiently refined to discover wherein the improvement

in this instrument lies, and as it gives us a pain in the jaw to think much about it, we shall content ourselves with Mr. Skene's statement; who says, that it "consists in the curve of the claw being different from that of the common key extractor, and a groove being made in the bolster, whereby the instrument is rendered fit to act as a pair of forceps and lever, enabling the operator to draw the tooth perpendicularly. The two fore-fingers of the hand are to be applied as the moving power to the lever, and the handle of the instrument to be rested against the inside of wrist to form the fulcrum. A slight twist causes the claw and bolster to keep their hold on the tooth."

Mr. Skene appears to misapply sadly the common terms of science.

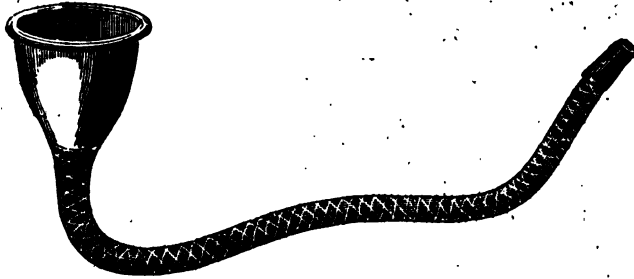
30. *Ligature Tensor, by the same.*—See page 316, last volume.

31. *Medical Spoon, by C. Gibson, of 71, Bishopsgate Street.*—Annexed is a representation of the spoon for which Mr. Gibson was rewarded by the Society of Arts with an honorary medal, and it has since, we are informed, been considerably patronized by the faculty, as extremely useful in administering medicine to patients, especially to those in a recumbent position, and to such as are disposed to resist



the taking of it. The spoon is to be *filled* at the lid, (which is shown open in the drawing,) and the thumb being then placed upon the aperture at the end of the hollow handle the medicine is prevented from running out, until the spoon is secured in the patient's mouth; the thumb being then removed, the medicine flows out in consequence of the admission of air.

32. *Flexible Ear Trumpet, by Mr. J. Hancock, of North End, Fulham.*—The annexed cut is a representation of this highly useful instrument; being made of indian rubber, its flexibility renders it the more convenient for portability, or for its ready application in any situation that may be required. It is got up in a neat and elegant manner, by being covered with a net-work of gold or silver wire, which renders it more pleasant to handle. We found by experiment



(speaking through it to our own ear) that it conveyed sound very perfectly. We have heard that Mr. Hancock has successfully applied tubes of this description as speaking pipes, to communicate verbally with the various parts of an extensive manufactory.

33. *Revolving Platina Light Apparatus, by J. Harley.*—In this instrument "the jet piece revolves so as to throw the flame upon the lamp in front, after the gas is ignited by the heat of the platina. By the same movement of the cock by which this is done, the cover of the platina vessel is removed and replaced. By this improvement of the former apparatus, the cock of which is exhibited along with the article for comparison, this interesting mode of producing instantaneous light is rendered more practically useful."—*Catalogue*.

35. *Self-acting Piano Forte, by Rolfe & Sons.*—This is an instrument of great power and brilliancy of tone. The chromatic scale is rendered more perfect by the introduction of several notes hitherto excluded. The machinery by which it is worked is upon the same principle as that described by us, page 240, vol. ii. N. 8.

36. *Improved Harp, by Grayson & Co. of 11, Soho Square.*—The improvement consists in the pedal movement, in which the friction is greatly diminished by levers of a new construction. Another improvement is made upon the forks, which describe two semi-circles upon the same centre, and thereby avoid the jarring of the strings against the prongs.

37. & 38. *Two Cosmographical Globes, differently mounted, by Dr. Muller.*—These have been alluded to in our account, page 196.

39. *A Water-proof Sea Chart, by T. Stackhouse, Jun. of 41, Provost Street, City Road.*—This chart is printed upon paper as usual, stuck upon cloth, afterwards covered with a transparent water-proof and very flexible composition.

40. to 43. *Specimens of the Patent Keramographic Globes, by Addison.* See page 240, last volume.

43. *Patent Copying Press, by Ritchie.*—See description of in our last number, page 177.

44. *Floating Inkstand, by T. N. Parker, of Oswestry.*—This is a more useful than comely contrivance: in the centre of a circular dish is fixed a cylindrical cup of ink; a thick circular piece of cork of the exact area of the cup, floats upon the ink, and in the centre of the cork is a small well, supplied with ink through a small perforation on one side; into this well the pen is dipped for writing, affording a uniform supply of clear fluid ink, and preventing (as the chronicler saith) "the possibility of the pen being immersed in the sediment." Where a great quantity of writing is constantly going forward, this apparatus may be desirable, but we question its advantages for general purposes; we do not perceive why the little central vessel into which the ink flows should not get foul as well as other inkstands, whilst it must be much more troublesome to clean.

PROCEEDINGS OF SCIENTIFIC INSTITUTIONS.

We feel it due to a portion of our readers to apologize for the many omissions recently made in the above-mentioned department, by stating the fact, that the fault lies generally with the Institutions themselves in neglecting to furnish us with the information of their proceedings. Being fully sensible of the interest which the members of the respective Institutions take in information of the kind, we beg to state to them that we are, and have been always, *desirous* of inserting brief accounts of their proceedings and announcements of lectures; but that we shall not feel ourselves bound in future to take any *extraordinary* pains to procure that which it is so much the interest of the Institutions to furnish.

MEDICO-BOTANICAL SOCIETY.—On the 24th ult. the King of Naples, the Prince Royal of Prussia, and several noblemen and gentlemen of distinction, were admitted Fellows.

LONDON MECHANICS' INSTITUTION.—On Friday, the 6th, Dr. BIRKBECK commenced the first of a course of lectures *On the application and improvement, mechanical and physiological, of Animal Power*; on which occasion he introduced to the notice of the members the numerous models of "fire-escapes" which had been submitted to the "Society for saving life from Fire," and were described in our last and preceding numbers. The practical application of many of these machines was shown by numerous descents from the upper gallery to the ground floor of the Theatre. The subject will be continued on Friday, the 13th, and the succeeding Fridays.

LINNEAN SOCIETY, 3rd March.—An interesting and extensive collection of dried plants from the deserts of Sinai, and Abkaba, in Arabia; and a cone of the Chilean pine from the mountains of Chili, were laid before the Meeting.

MEDICAL AND CHIRURGICAL SOCIETY.—The anniversary meeting of this Society was held on the 2nd of this month, when the principal officers for the present year were elected. Dr. Roget was elected President.

SOCIETY OF CIVIL ENGINEERS.—At the meeting of this Institution on the 17th February, Mr. JOPLING explained the construction and properties of two newly-invented instruments; the one for producing an ellipse, the other, the Ionic spiral; for which Mr. Jopling received the thanks of the Society.

Mr. Jopling read also a paper on "generating ellipses," which he illustrated by reference to drawings.

Mr. M'NEIL produced a specimen of paving, which we have lately seen applied very successfully. It is composed of gravel-stones cemented together, and forms an excellent foundation over clayey soils, for a subsequent super-stratum of the usual road metal.

SOCIETY OF ARTS.—On the 24th, the Secretary, Mr. AIKIN, read a very luminous and interesting paper on printing in stereotype, introducing it by a general history of the art of printing, tracing it from its rise in the fourteenth century to the present time, illustrating the whole of his subject by numerous specimens.

A curious Japanese screen was sent in to the Society by Mr. T. COOPER, of Bond Street; two models of sounding boards, by the Rev. J. BLACKBURN, (illustrative of his paper on the subject); and an interesting series of resins, gum-resins, balsams, and gums, by Mr. H. HENNEL, were also presented to the Society.

ROYAL INSTITUTION.—On the 27th ult. Mr. FARADAY gave a very interesting lecture on the disintegration of stone and other building materials, by the action of the weather; a great number of architects were present among the company, who evinced their satisfaction at the luminous manner in which the subject was treated.

ROYAL ACADEMY.—Mr. WESTMACOTT delivered his third lecture on the Elgin Marbles on Monday last.

REVIEW OF BOOKS.

"The Natural History of several new popular and diverting Living Objects for the Microscope, with the phenomena presented by them under observation, &c.; conjoined with accurate descriptions of the latest improvements in the diamond, sapphire, aplanatic, and amician microscopes, and instructions for managing them, &c. To which is added, a tract on the Newly Discovered Test Objects; illustrated by highly finished coloured engravings, from drawings of the actual living subjects, by C. R. Goring, M. D., and Andrew Pritchard."—Published by Pritchard, 18, Picket Street.

THE above is so explanatory of the nature and contents of the work, as to render it only necessary to add on those points, that it is to be published in numbers quarterly, and that each number will contain a tract on some subject connected with the *instrument*, conjoined with another on the *objects*, and be "perfect in itself."

The first number, published in February, is now before us, and judging by this sample, (as a merchant would say) of the bulk, we anticipate that microscopists will be laid under a heavy obligation to Messrs. Goring and Pritchard. Unlike the majority of scientific publications of the day, this is written by *practical* men; by *enthusiasts* in the science they cultivate; who *invent* and *construct* their own instruments, *seek* their own living objects for observation, *contrive* the means of confining them, while they make their own *elaborate drawings* of all the minutiae of their diminutive prisoners. This is the way to do the business properly, of supplying the place of those gross caricatures of living objects, with which works on microscopic science have been heretofore so liberally furnished with the view apparently of *wonder-making*, rather than that of furnishing correct views of the refined organization of those minute orders of beings, who being invisible to our naked sight, we should be debarred the pleasure of contemplating, were it not for the labours of such men as the authors of this work.

The advanced state of excellence to which microscopes have recently been brought, and the fact that no information is to be obtained respecting their construction and use, except by an absolute *ferretting* through a host of periodical journals, renders a regular treatise on the subject of great value.

The authors propose to divide the subject into two departments, one on the instruments, and the mode of managing them, and the other on the objects; but the distinct tract promised on the *test objects* will be of the greatest advantage to science, as they afford the ready means of ascertaining the defining and penetrating powers of microscopes. The discovery of these objects will indeed form an era in the history of the instruments, for to this cause may be attributed the great improvements made in the aplanatic and amician microscopes by Dr. Goring, and the substitution of diamond and sapphire lenses for those made of glass by Mr. Pritchard.*

The number before us is illustrated by two superior coloured engravings, exhibiting very large magnified representations of the larva and pupa, of two aquatic insects, with little figures beside them of their natural size. These objects are drawn from the life by Dr. Goring, who thus humourously describes the difficulty attending operations of this nature.

"If any portrait painter had to execute a likeness of some person afflicted with chorea, who could not be prevailed upon to be quiet for more than half a minute together, but who was perpetually jiggling about the apartment, and exhibiting his tail instead of his head, I think he would be compelled to admit that he had undertaken a task which would at least require time and patience for its completion, but if, in addition, the said person was to be removed to a distance, so that the artist could only see him with a powerful telescope, and had to follow his motions as well as he could, and be content to catch a glimpse of him while crossing his field of vision now and then,

* See Register of Arts, vol. iv. p. 360.

according to the humour and good pleasure of the said individual, I think the worthy limner would begin to think, that after all, there was *some* difficulty to contend with."

"Now this case I conceive to be an exact parallel to that of drawing living objects with a microscope. Their incorrigible restlessness so baulks and baffles the artist, that he is frequently compelled to lay down the pencil to regain his lost temper, and fresh courage to proceed: in many cases his best resource is to study the object *till he has got all his features by heart*, then to set them down on paper, study again, and gradually correct them; by the time he has made half a dozen rough sketches, he will get pretty near the truth; he may then commence a regular drawing. I can safely say that I have drawn many of my objects five or six times over before I could arrive at my portraiture."

* * * * *

"But it will probably be asked why I did not kill my object, before I drew it, instead of giving myself such unnecessary trouble? I answer, that I never could make a drawing to my mind from a dead aquatic larva or insect. Such is the extreme delicacy of their organs, and so rapid their decomposition in water, that long before a drawing can be executed, the main and capital parts of the internal, and even external structure, in most subjects, will become confused and unintelligible. If they are removed out of the water, a still greater change is effected by their drying, their colours vanish, and their whole appearance is totally changed, &c. &c."

In the preparation of this work for the press, Dr. Goring has undertaken the description of the instruments, and the test objects; Mr. Pritchard, the history, the appearances under the microscope, and the description of the drawings. The former gentleman is well known in the scientific world, as the author of various tracts relative to the microscope; the latter is an eminent mechanical draftsman,* an amateur optician, and as we happen to know, the author of *two treatises on optical instruments*, forming two of the publications of the Society for the Diffusion of Useful Knowledge.

We were desirous of adding some extracts from the present number of this work, descriptive of the wonderful phenomena brought to light by the microscope, but having no room for them, we must refer our readers to the work itself for all those interesting matters.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from p. 168.

As the following letter received from an intelligent foreigner furnishes some interesting facts and observations on the above-mentioned important subject, we have thought it right to place it under that head, and to consider it as a continuation of our articles.

* The late pupil and relative of Mr. Cornelius Varley.

Bristol, March 4, 1839.

SIR—Relying on your liberality as a scientific man, I venture though a foreigner, to claim for my countrymen the honour of being the earliest inventor of apparatus for consuming smoke; although it is probable you are quite right in your statement, that the late celebrated Mr. James Watt was the first to apply such to the furnaces of steam engines. In France, apparatus for the purpose was successfully used in the seventeenth century, in many manufactories. In the volume of the Academy of Sciences for 1699, some experiments by M. De la Hire are given, which have reference to a previous invention by M. Delasme.

The fire-place of M. Delasme is stated to be like an inverted syphon, the longest leg of which formed the chimney, and the shortest the furnace. The latter had of course, a grating, and the coals supplied from above were placed upon it. Soon after ignition of the fuel in the smallest limb, the larger became heated, and by that means a current of air was caused to pass downward through the fuel, and under the grate, where the smoke was consumed.

Delasme's apparatus was described in Dr. Boerhaave's Treatise on Chemistry, and likewise in *Annales de Chimie*, for 1809, in a report made by M. Guyton Morveau, and De Prony, on a method employed at the mint, in Paris, by M. Gengembre, to consume the smoke of a steam engine furnace; and as some of the observations of those gentlemen seem to afford a very clear view of the theoretical part of the subject, I shall take leave to transcribe them for your notice, from an English translation before me.

It is well known that black smoke is formed of the volatilized parts of the fuel, which are suspended in the transparent gases given out in the process of combustion. These volatilized parts, are, as it were, lost to the fire, partly because the mass of air which yielded the oxygen was not in a proper proportion to the quantity of the fuel, and partly because the fuel was not sufficiently heated to decompose the air with which it was in contact. The recent progress which the theory and practice of the arts which depend upon chemistry have made in France, have furnished for some years past several important occasions of finding out the best method of fulfilling the conditions necessary for a complete combustion, free from any inconveniences; the principal of which are:—

First, such a disposition of the fire-place, that a current of air may be established, flowing through the door, or some opening into the pipe or chimney, by which the gases, set free by the combustion, are allowed to escape.

Second, the flowing upon the fuel of a mass of air, in a due proportion to the quantity of fuel, and in such a manner that the fuel shall find in the air which comes in contact with it, such a quantity of oxygen, that all the molecules of the fuel which are capable of being combined with that constituent part of the air shall unite with it.

I am, Sir, &c. JEAN LEVEQUE.

TO OUR CORRESPONDENTS.

The List of New Patents and the Answers to Correspondents will be given in our next.

NATIONAL REPOSITORY.

(Continued from p. 204.)

Towing Wheel for Canal Boats and Steam Tugs, by Alexander Christie and Co., of Sheffield.—We have so often noticed the defects of the common paddle wheel, and the loss of power occasioned by the oblique action of the floats, that it would be needless to expatiate more on that part of the subject. In the numerous ingenious inventions that have been proposed to obviate these defects, by causing the floats to enter and leave the water in a vertical position, none have surpassed in the simplicity of their arrangements that which is represented in the model before us. We have been informed, that this invention has been fully tried at Liverpool, and found to be decidedly the best for *towing* of any which had appeared, and it is therefore well deserving of a description in this place.

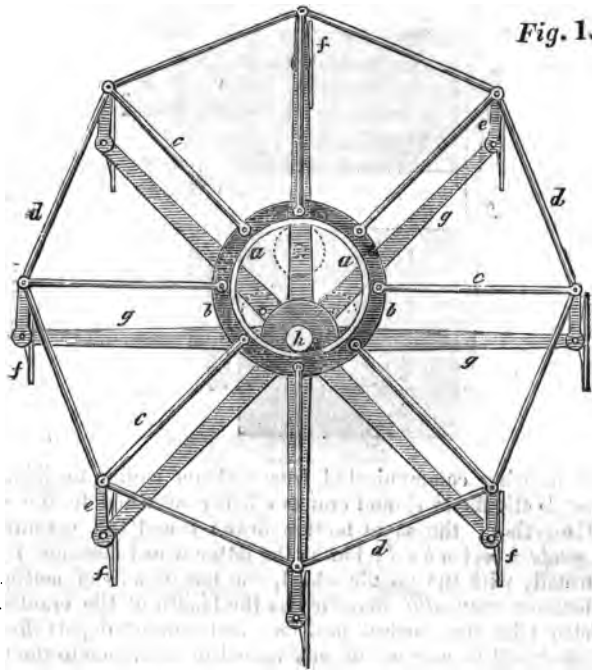
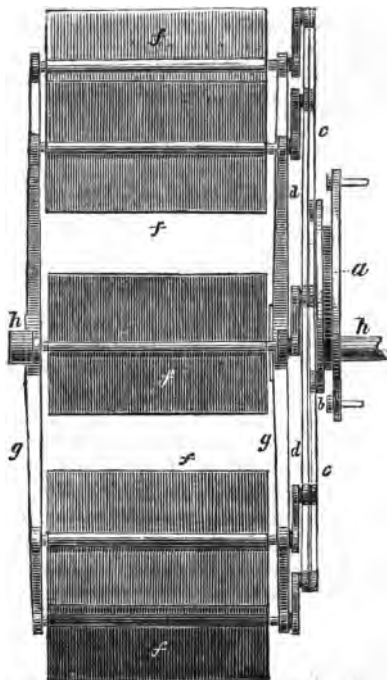


Fig. 1 represents a view of the wheel from the side next to the vessel, and fig. 2, an end view of it; the same letters in each figure referring to similar parts.

aa is a hoop, projecting from an eccentric block fixed to the side of the vessel (not shewn); *bb* is a revolving annular plate, to which are attached by joints the guide-rods *cc*; these guide-rods are braced

together by cross rods *dd*, pinned to their extremities, the pins forming the axes or joints by which they are connected to the end of the cranks *ee*; the other ends of the cranks are fixed fast to the axes of the floats *ff*, after passing through the extremities of the arms *gg*, of the paddle wheel, in which they turn freely, as the wheel revolves on its axis *h*.

Fig. 2.



Motion being communicated from a steam engine to the axis *h*, the arms *g*, the floats *f*, and cranks *e* being attached to the same, revolve together; the same motion draws round the eccentric or rather *guide* wheel *abcd*; but as the latter wheel does not revolve concentrically with the paddle wheel, but has its axis of motion the same distance *vertically* above it, as the length of the cranks, the latter also take the vertical position, and cannot depart from it; which effect will be more easily understood by reference to the drawing, than by further explanation.

As our diagrams were made from memory, it is probable we may have omitted to describe the eccentric movement fully, and to introduce some anti-friction rollers in the interior of the hoop which we do not recollect observing; we have accordingly in fig. 1, put three dotted circles, where we suppose they would be introduced for the purpose of supporting the weight and reducing the friction of these parts, in a machine of the full size.

It will be readily perceived, that the principle on which this wheel is constructed, is applicable to undershot water wheels; and supposing the paddle shaft to be vertical, instead of, as it is, horizontal, and one half of the wheel to be screened by a light wooden cap, turning on its own axis, so as to expose the broad face of the float-boards of one half of the wheel only to the wind, a very powerful horizontal windmill would be formed.* And it appears to us to be a subject worthy the consideration of mechanics, whether a wheel on this principle might not be advantageously adapted to a locomotive engine and carriage, to travel on the common road, by shosing the edges of the floats with iron plates at right angles to the floats, and making them of sufficient strength?

45. *Model of an Apparatus for Driving Piles in deep water, by J. P. De la Fons.*—We have already referred to this invention in our notice of the floating suspension bridge at page 197, and which was fully described at page 182 in our last volume. The object of it is the driving of peculiarly constructed piles into the earth, at considerable depths under water, for the purpose of forming moorings for ships, breakwaters, piers, &c. The plan is in many respects highly ingenious and novel, and calculated to facilitate the construction of works of great public utility. Whilst noticing this subject, we may be permitted to call the attention of the reader to our apparatus for boring the earth (Nos. 9 and 10 in Catalogue,) which affords a demonstration of the ready application of a machine, nearly of the same construction, for driving piles in oblique positions under water; the central rod forming an unerring guide for the ram, which is represented by the sliding auger in the boring apparatus. A more simple machine for the purpose cannot be devised, and we see no reason why its application should not be perfectly effective under many circumstances.

46. *Specimen of a common Chain Pump, manufactured by C. F. Sladen.*—This is a handsome well-constructed model of the very useful machine it represents. The chief advantages of pumps of this description consist in their not being so liable to become choked, and the facility with which repairs can be made: for these reasons they are generally preferred on board of ships, in the construction of aquatic works, and on situations where a mixture of foreign substances with the water cannot be easily avoided.

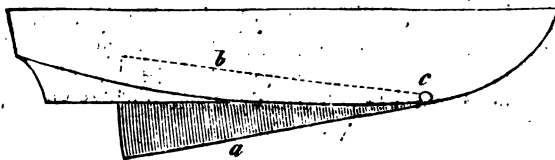
47. & 48. *Specimens of improved Pulley Blocks, by Lieut. F. Bothway, R. N.*—We shall in our next give a particular description of these meritorious improvements, with drawings.

* This effect may be advantageously viewed in the model in the Repository, by turning it on one side with the handle upwards.

49. *Patent Paddle Wheel*, by *Lieut. Shene, R. N.*—See description of at pages 46, 297, & 299, last vol.

50. *Metallic Sliding Keels*, by *Lieut. R. Shuldhham, R. N.*—The object of this invention is to steady a vessel, or enable her to preserve her erect position under a press of sail, or to take advantage of the wind by the spreading of canvas, which could not otherwise be done without the imminent risk of being capsized. A great power being thus obtained, a small vessel may be propelled through the water with much greater velocity than without it. But as safety from being swamped is frequently an object of more importance than fast sailing, the lowering of the sliding-keel goes far to effect it. The boat is thus made at pleasure of greater depth externally, presenting an increased power of resistance against the effects of the wind, which has in consequence to displace a larger body of water, the resistance of which increases in a greater ratio than the depth. To steady the motion of ordinary vessels, ballast is placed in the lowest part of the hold, but the sliding keel becomes a ballast, to be employed according to circumstances or the exigencies of the case.

At pages 214 and 247 of our first volume, first series, the patented invention of Major Willoughby for this purpose is described; these keels were parallelograms in shape, and were *wholly* raised or depressed by vertical bars to which they were suspended. This plan is simplified and much improved upon by Lieut. Shuldhham in the model before us, of which we annex a diagram.



a represents the sliding keel lowered down into the water; the dotted line *b* the recess into which the keel is raised or deposited when not used: *c* is the joint or fulcrum upon which it turns on being raised or lowered. This mode of working the keel is far better than Major Willoughby's, but the resistance of the triangular keel of Lieut. Shuldhham's is not so great as the Major's. On the other hand, the Lieutenant's boat will run over sand banks and rocks without injury, which would destroy the Major's.

JAMES'S PATENT STEAM CARRIAGE.

We have the pleasure of announcing to our readers, that a highly satisfactory experiment was made on the 5th inst. with Mr. James's patent steam carriage, constructed on the principles described in our 4th vol. p. 20. Since the period when that account was given, Mr.

James has been ardently engaged in endeavouring to surmount these difficulties, which have hitherto been found insuperable by other persons occupied in the same noble pursuit.

Having invented an appropriate method of distributing and applying the momentum to the machinery, (as above referred to), which combined some important advantages, Mr. James next directed his attention to the discovery of the most eligible apparatus for generating the requisite force, subject to those conditions which the previous circumstances attending its application to locomotion render indispensable, and which so much limit the exercise of inventive talent. The result of these investigations was the construction of a cylindrical boiler, composed of a peculiar organization of annular tubes, a full description of which is given in our 4th vol. p. 354. This form of boiler, when constructed of the usual thickness affords such immense strength as to be capable of resisting steam of the highest pressure to which it can be brought in an ordinary furnace; therefore, perfectly safe, even when subjected to a force ten times greater than that which it is necessary to resort to in practice. This form is likewise adapted to receive the full effect of the heat given out by the fuel, which is reverberated over the whole of its extensive surface: steam is consequently produced by it with great rapidity, and attended with an economy of fuel, amounting, we are informed, to full one-half of that consumed in ordinary. It is likewise worthy of observation, that the expansion and contraction of the metal unavoidably incident to vessels exposed to a considerable heat, have been found very inconvenient and destructive to tubular boilers, which circumstance, together with the difficulty of preventing internal stony incrustations, and the cleaning of them out, has very generally lead to their abandonment; but it is evident that the expansion and contraction of ring-formed vessels can have no such injurious tendency; the slight alterations which they may thus undergo in their dimensions will not alter their figure, and there are no parts to be opened, weakened, or separated from these causes; while the cylindrical figure of the whole apparatus adapts it to being poised at pleasure upon a central axis at each extremity, and to be scoured out clean by the simple means provided for that purpose.*

Having thus obtained the command of a great power in a very small space, and determined upon the propelling machinery, the building of the carriage was commenced about twelve months ago. Numerous vexatious delays took place in the progress of its construction, from various causes, which it is unnecessary to explain. For, however well digested may be the leading arrangements in an undertaking of this kind, improvements are continually suggesting themselves so as to make it an almost constant doing and undoing for a considerable period of time; here, let it be considered, that in a machine necessarily consisting of numerous parts, many novel combinations are required to produce certain effects, which have never been tried,

* We have been informed that the patentee has improved upon the mode described in his specification, and that no deposition whatever now takes place.

and which cannot be tried until the whole apparatus is put together. Then the alteration of one part entails the alteration of another, and each successive alteration is no sooner made, than the active mind of the inventor, (which is ever as it were upon the gallop), is mortified to think how much *better* it would have been so and so. Thus time proceeds, improvement succeeds improvement, and the machine is alternately patched and cut to pieces; then a new one is commenced and treated almost as unceremoniously. The repetition of such alterations, and the bracings required in consequence to give adequate strength, have altogether brought the present machine to a weight exceeding (we think) three tons; and this clumsiness which has been the result of accidental circumstances, we regard as extremely fortunate, as the means of propulsion are thereby put to a severer test. It may be inquired, how do we know all this? to which we reply, that having been seized with the locomotive mania ourselves, our anxiety to see the thing go has made us a complete Paul Pry peep in the matter; but we have forgot to state the experiment, which we will now do as shortly as our pen will let us.

This ponderous mass of iron and wood was provided with two working cylinders of only 3½ in. in diameter, and the steam was supplied to them by two small boilers of the kind mentioned, each being 4 ft. 6 in. long, by 1 ft. 9 in. diameter; notwithstanding which, it was propelled across Epping forest, over a rough gravelled road, at the rate of 15 miles per hour, for 4 miles, loaded at first with 15 passengers, and afterwards with 24. The speed was such as to keep a gentleman on horseback, who accompanied the carriage, at a full gallop all the way.

The tubes of which the boilers were constructed were the common gas tubes, in which the edges are only brought together to complete the circle; and connected by a sort of half welding process effected by machinery. This process is sufficiently stable for conveying gas, yet decidedly insufficient for the generation of steam at a very high pressure, and was only employed for the latter purpose as a temporary experiment. In consequence of the joints not being overlapped, and properly welded in the ordinary way, one of the seams opened, through which the steam escaped, and put out the fire of one of the boilers, and reduced the intensity of the other, as the communication between them could not be prevented. The carriage was now wheeled round to return home with the steam from only one boiler. The curiosity of the country people drew together considerable numbers on the road, and the carriage was crowded at one time with no less than 38 passengers, making a total weight of at least 6 tons; yet she carried them all gloriously along at the rate of 7 miles per hour, and ascended a hill for a quarter of a mile over a deep loose gravel, in which the wheels sunk from 2 or 3 inches, at the rate of 5 miles per hour: the carriage was now stopped to ascertain the practicability of starting upon an ascent; the steam being let on, the carriage pushed off instantaneously with such facility and speed, as if she was descending, instead of ascending an inclined plane. A waggoner, who observed the prodigious force with which the vehicle

moved through the deep gravel up the hill, declared that six horses could not produce such an effect. The defective tube, therefore, only served to prove, that one little boiler 4ft. 6 in. by 1 ft. 9 in. was adequate to the propulsion of six tons over the common road; a fact which we should not have credited but for this practical demonstration.

Now, as a new carriage might be constructed much stronger, and yet of less than half the weight of that experimented with, and as the resistance to the motion of wheel carriages has been determined to be much the same for all velocities, it follows that, by the application of the same power to the lighter vehicle, it would be propelled at double the velocity of the former!

Notwithstanding the unparalleled success attending this experiment, which incontestibly proves the possibility of running coaches by steam at even more than 20 miles per hour, we sincerely hope that it will not be attempted at present, as it would probably involve an almost ruinous expense of capital before that object was *perfected*. The requisite *power* is obtained: let it first be applied to the propulsion of waggons at *waggon-pace*; by easy gradations, strength, lightness, and simplicity, will be introduced, friction diminished, and speed obtained to any required extent.

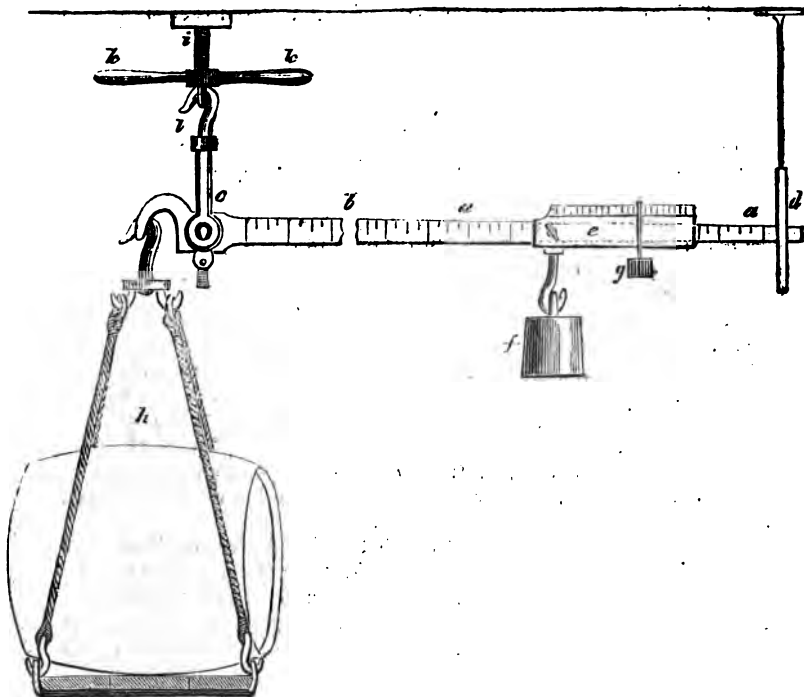
We should have mentioned that Sir James Anderson, Bart. has associated himself in this undertaking with Mr. James, to which he lends his active and scientific assistance; and that large premises have been taken near to Vauxhall Bridge for the purposes of a regular manufactory of the patent boilers, and the construction and experimental trials of several different vehicles, and where it is proposed to carry forward the enterprize in a manner suited to its magnitude and importance.

As we shall shortly have occasion to return to this subject, we quit it for the present; to make room for other matter.

PATENT WEIGHING MACHINE,

By B. M. PAYNE, Scale Maker, of the Strand, London.—*Sealed*
18th August, 1828.

THIS weighing machine is of the steel-yard kind; the longer arm is divided by lines denoting the various weights as usual; but instead of the weights being suspended by hooks immediately on the beam, which fall into notches on its edge to prevent their slipping, they are suspended to a long case or box which encompasses the beam, and slides thereon, but not too freely on account of the great surface thus pressed upon. Underneath one end of this sliding box is a large hook, to which is suspended the heavy weight, which measures the larger quantities, as *cwt.* *qrs.*, as denoted on the divided lines on the beam, as the sliding box is drawn over it; then to measure the smaller quantities, as *lb.* or *oz.*, there is a light scale of parts fixed to the top of the sliding box, to which a hook and weight is hung, and is used precisely in the same manner as the common steel-yard. The further arrangements we will explain in reference to the engraving.



aa is the beam, which being of greater length in proportion, than the scale of our drawing would admit, is shewn broken at *b*; *c* is the fulcrum; *d*, a long rectangular loop through which the arm *aa* passes for the purpose of support, when not in use, or to limit its vibrations when in use; *e* is the sliding box with its graduated scale, for minute quantities, ascertained by the situation of the smaller weight *g*; *f*, the larger weight, which is secured at pleasure, where it is placed by a thumb screw above, (half a turn of which fixes the slide against the beam,) while the more minute quantities are being taken; *h*, the scale, into which goods being put, they are raised from the ground (in order to weigh), by turning the handles *h h*, which causes the screw *i* to enter a nut above. These handles, we should observe, are additions of our own, as the patentee's method is to turn round the hook *f* by the hands, which is evidently, an awkward, laborious, and insecure method of operating.

Mr. Payne constructs weighing machines upon this principle of all sizes, to weigh ounces and pounds as well as tons, and as there are unquestionably some advantages attending his plan, we wish him plenty of orders.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from p. 208.

In 1801, Messrs. James and John Robertson, of Glasgow, patented a method of burning the smoke of furnaces. This invention having already been fully described by us at p. 314, vol. 4, we shall here merely state, that it consisted in a method of supplying the fire more fully with air, having a less quantity of fuel in combustion at a time, so as to obtain a very strong heat, and to give out but a small portion of smoke, which, being brought into contact with a downward current of air proceeding through an aperture made in the furnace above the fuel, was ignited and consumed. The successful results attending this plan induced numerous manufactories to adopt it. The coal was admitted to the furnace in uniform small quantities at a time, and distributed in such a manner upon the grate, that the smoke from the fresh fuel should be made to pass over that which was in a high state of ignition.

About the year 1810 several plans for consuming smoke were introduced to the notice of the public, all of which were considered by their promoters as the *ne plus ultra* of perfection, but the exact order of priority it is not easy to determine. In the report of the committee appointed by the House of Commons to examine into this subject, we meet with the following evidence, which is deserving of attention, and has, we believe, the precedence of date over those which we shall afterwards describe. We give the extracts from the report verbatim.

" Mercurii, 16^o. die Junii, 1819.

" Mr. MATTHEW MOULT, called in and examined.

" What are you?—I assist Messrs. Cooke, and am in the habit of putting up evaporating furnace boilers; I have erected one for Messrs. Cooke, whom I occasionally assist.

" State where it is, and the nature of it.—At Stow Brow Allum works, near Whitby, belonging to Messrs. Cooke. My method of putting up boilers is this: the former mode of heating the boilers, was by putting the coals over the bars in the common way; but my method is to make the flame come over the coals, which are laid upon an iron plate, and the flames made to pass over the surface of the coals upon the iron plate which light the coal at the top, and the red part of the coal is next the bottom of the boiler; by that means the smoke as it rises from the coals is consumed in its passage over the bars. I put another up at Peak, about two miles from the first place, likewise belonging to Messrs. Cooke. I put that up by way of saving coals.

" What was the saving of fuel?—The consumption of fuel of the old boiler was regularly eighteen bushels of coals in twenty-four hours; but when altered in this manner, twelve bushels produced a similar effect.

" Was the smoke completely consumed by this method?—Not

completely; but there was no more smoke than from a common chimney.

"I presume, from what you say, the smoke bore no proportion to what it was under the old method?—Not at all. I put up a small boiler for a steam engine upon the same plan, and found it answer.

"Is the furnace to which you allude, such a furnace as can be used in any manufactory, such as soap, and other articles of that nature?—I think it would be applicable to soap manufactories, because their boilers are generally long boilers: in some steam engines, I think, from situation, it would be difficult to do it, because the fire is obliged to rise in the front, and pass that way. The present mode is to have bars in front, and to put the coals upon these bars; and they would have to put the coals beyond the bars, which would be a great distance from the mouth of the furnace. I think it would be rather inconvenient to get to the coals, and to get them beyond the bars.

"Is there any increase of expense in the furnace you erected for Messrs. Cooke?—The difference of expense was, that the former bottoms of the flue were brick-work, but when it was altered to this way of heating the boiler, iron plates were put along the top, for the purpose of preventing the coal-rake from drawing up the brick-work; that was the only reason why the iron plates were put.

"So that the only additional expense is the iron plate?—Yes; that was the only difference of expense.

"What may that amount to?—I really do not know; but it may be done with the Welsh fire-clumps.

"Does the plan pursued by Messrs. Cooke effectually answer?—Yes, it does.

"How long is it since they adopted that plan?—I think in 1810. The manufactory stands not far from the house in which Mr. Cooke resides when he is down in that part of the country. The smoke, when the wind was in a particular direction, used to annoy the house; but after the furnaces were altered, it was found to be very little annoyed by the smoke."

To be continued.

ON THE FRICTION OF VARIOUS SUBSTANCES,

By GEORGE RENNIE, F.R.S.

THE following are conclusions from experiments by Mr. George Rennie, F.R.S., detailed in a paper communicated to the Royal Society. The friction of ice rubbing upon ice diminishes with an increase of weight, but without observing any regular law of increase. When dry leather was made to move along a plate of cast-iron, the resistance is but little influenced by the extent of surface. With fibrous substances, such as cloth, the friction diminishes by an increase of pressure, but is greatly increased by the surfaces remaining for a certain time in contact: it is greater, *ceteris paribus*, with fine than with coarse cloths: the resistance is also much increased by an increase of surface. With regard to the friction of different woods

against each other, great diversity and irregularity prevail in the results obtained: in general, the soft woods give more resistance than the hard woods: thus, yellow deal affords the greatest, and red teak the least friction. The friction of different metals also varies principally according to their respective hardness; the soft metals producing greater friction, under similar circumstances, than those which are hard. Within the limits of abrasion, however, the amount of friction is nearly the same in all metals, and may in general be estimated at one-sixth of the pressure. The power which unguents have in diminishing friction, varies according to the kind and the fluidity of the particular unguent employed, and to the pressure applied.—*Phil. Mag.*

FABRIC OF THE SINGALESE AND PALI BOOKS.

USE OF THE LEAVES OF THE TALIPOT.—All the books of importance in Pali and Cingalese, relative to the religion of Buddhoo, in Ceylon, are written on lamina of the leaves of the Talipot, or *Corypha umbraculifera*. The Pali and Cingalese character is engraved upon them with either a brass or an iron style. There are some of these books in Sir Alexander Johnston's collection, which are supposed to be between five hundred and six hundred years old, and which are still very perfect.

This leaf is used in the maritime provinces of Ceylon as a mark of distinction, each person being allowed to have a certain number of them folded up as fans, carried with him by his servants; and also, in the Kandian country, in the shape of a round, flat umbrella, on a long stick. It is, moreover, used in making tents. Sir Alexander Johnston gave a very fine specimen of a tent made of these leaves, large enough to hold a party of ten persons at table, to the late Sir Joseph Banks, in 1818.—These leaves are also used by the common people, to shelter themselves from the rain, one leaf affording sufficient shelter for seven or eight persons.—*Gard. Mag.*

COPY OF THE BUDDHIST CODE.—Sir Alexander Johnston gave the Royal Asiatic Society, some time ago, a complete copy of the Pali book, called the *Pansyapanas Jatakay*, written on 1172 laminæ of the finest description of the Talipot palm leaf. This book contains the whole moral and religious code of the Buddhist, and is so scarce, that it was for some time believed that there was no complete copy extant. Sir Alexander Johnston, when president of His Majesty's council in Ceylon, being, from the various benefits he had conferred on the priests of Buddhoo and their followers, much in their confidence, was allowed by them to have this complete copy taken of all the different parts of it, which were dispersed amongst the most celebrated temples in Ceylon. Sir Alexander also gave the Asiatic Society a very fine specimen of a Burmese book on the Buddhoo religion, written upon laminæ of this leaf, which are beautifully lacquered and gilt over, which was sent to him by the King of Ava, along with some other books, as the finest specimens he could give him of the manner in which the books were written and bound in his library at Ava.—*ib.*

PROCEEDINGS OF SCIENTIFIC INSTITUTIONS.

LONDON MECHANICS' INSTITUTION, March 11.—MR. DAKIN gave the first of a Course of Four Lectures on Voltaic Electricity, which will be continued on each succeeding Wednesday.

March 13.—DR. BYRNESSE gave his second Lecture on the Application of Animal Power to Machines, which was chiefly occupied by a further consideration of the means of saving life from fire, on which occasion a considerable number of fire-escapes were exhibited in operation and explained; these machines, for the most part, consisted of the numerous models sent to the newly-formed Society for saving Life from Fire. The President will continue the subject of his intended course of lectures on the next and succeeding Friday.

ROYAL SOCIETY.—A paper on the *Reduction to a Vacuum of the Vibrations of a Pendulum in Air*, by the Secretary, CAPT. SABINE, was read; also, another descriptive of the experiments made with Chevalier Aldini's newly-invented dress, proposed to be worn by firemen, to resist the action of flame.

ROYAL INSTITUTION, March 6.—MR. BRANDE delivered a discourse on the *Theory of Etherification*.

ROYAL ASIATIC SOCIETY, March 7.—Some papers were read relative to the customs of the Eastern World. Some presents were received from the Hon. Sir Gore Ouseley, and some additional presents from Sir Alexander Johnston.

SOCIETY OF ARTS, March 10.—The Secretary gave an "Illustration" on Gypsum, and its principal uses.

SPITALFIELDS MECHANICS' INSTITUTION.—Notwithstanding the very depressed state of the manufactures carried on in this district, the Members of the Institution have increased, and its income has exceeded its expenditure, owing, we conceive, chiefly to the very liberal assistance afforded them by gratuitous lectures from the following gentlemen—Messrs. Preston, Poole, Hemming, Mitchell, Williams, and Garvey. Professor Millington has likewise kindly promised his services.

READING MECHANICS' INSTITUTION.—Members are considerably increased since the anniversary; at which time and since, Mr. Hemming gave them his powerful assistance in several lectures. Many presents of money and books have been received, and affairs are altogether very prosperous.

NEWPORT PAGNELL MECHANICS' INSTITUTION.—In this small town a Mechanics' Institution has been established, beginning with 119 members; and having for their President, the member for the county, the Hon. Robert Smith; Vice-Presidents, the Rev. T. P. Bull, and Captain Moorson, R. N. That justly popular lecturer, Mr.

Hemming, gave the inaugural discourse, and has since given several lectures.—Terms of subscription only six shillings a year. *Thus is given, the use of a Library, a Reading Room, admittance to lectures, and a scientific education, for less than three halfpence per week!*

MISCELLANEOUS INTELLIGENCE.

SPOTS ON THE SUN.—An ingenious individual in Providence has very recently succeeded by means of a seven feet telescope, constructed by himself on a new principle, in bringing the entire image of the sun into a darkened room, upon a white screen, to the size of eight feet in diameter. He writes us that his astonishment was great when he perceived that every spot now upon the face of the sun, nine in number, was distinctly transferred to the screen, and was so plain that he could see every movement of them in their various and sudden changes. He says that he could plainly discover that those spots were immense bodies of smoke apparently issuing from volcanoes; and as they seem occasionally forced upward from the craters, now forming dense clouds, and now dispersing; considers these phenomena as accounting for the rapid changes of those spots. The escape of such a vast quantity of gas from the interior of the sun would, he observes, as it surrounds that luminary, produce that bright and dazzling appearance which is the atmosphere of the sun. This theory may not accord with the opinions of others who have made observations on the subject, but the writer at any rate entertains the strongest belief of its truth. With the same instrument, which is but just finished, he has also examined the moon, and states his conviction that that body is covered with perpetual snow, and in the dark spots discoverable on its surface being frozen seas, and the lighter spaces land covered with snow. These circular places which have a rising cone in the middle, he thinks are extinguished volcanoes, as no clouds are perceptible over the moon's face, which being covered with snow and ice, accounts, as he imagines, for its clear atmosphere, or for the absence of an atmosphere. This vast accumulation of ice and snow upon the moon's surface may be explained, the writer conjectures, by the nature of the moon's revolutions. He offers to construct instruments of the above description by which these phenomena may be observed, at prices from 50 to 100 dollars, and at the same time to furnish solar microscopes on a new principle, with a magnifying power at 12 feet distance of 5,184,000.—*Boston Bulletin.*

ECONOMY IN THE USE OF GAS.—The '*Philosophical Magazine*' of February gives the following results of experiments made by the Rev. W. Taylor, of York, on the combustion of coal-gas:—

Exp. 1.—A piece of wire-gauze being laid upon the glass chimney of a common Argand gas-burner, the flame is immediately enlarged to twice its former dimensions, and its light fully doubled.

(A similar experiment being tried with a common Argand oil-lamp, or reading lamp with a flat wick, the flame is often enlarged, but so discoloured as to yield less light.)

Exp. 2.—Place the finger, or bit of cork, so as to close the lower opening of the interior passage of a common Argand gas-burner:—the flame experiences a sudden enlargement, with an increase of light nearly equal to that in *Exp. 1.*

(The inner air-passage of an Argand oil-lamp being closed, the flame is greatly deteriorated and darkened.)

Exp. 3.—The air-tube of an Argand gas-burner being stopped as in *Exp. 2.*, and the flame consequently enlarged, no further change happens when wire-gauze is laid on the top of the glass chimney.

Exp. 4.—Over the glass chimney of a *singls-jet* gas-burner, wire gauze being laid, produced no enlargement of the flame, and no increase of the light.

In an experiment at the rooms of the Mechanics' Institute, York, it was found that *one hundred* feet of gas were consumed in three hours and twenty-five minutes, by six Argand gas-burners in the ordinary state; while the same gas-burners, *provided with wire gauze caps* to their chimneys, yielded an equal light for an equal time, but consumed only about *fifty* feet of gas.

NON-EXISTENCE OF HEREDITARY DISORDERS.—A recent work, *L'Art de conserver la santé, et de prévenir les Maladies Héritaires*, by Dr. P. I. Mongellaz, of Paris, as reported in the 'Bulletin Universel,' contains some important views on the subject of hereditary disorders; such as consumption, scrofula, gout, gravel, madness, &c. The author shows, that the opinion that these and various affections are hereditary rests on very slight foundations: and he maintains, in short, that there are, strictly speaking, no hereditary maladies, but only hereditary dispositions to contract maladies; and that, by proper precautions, individuals born of parents subject to any of the maladies mentioned, may be secured from being themselves affected by them. The importance of this view of a subject on which there exist so many pernicious prejudices, and on which the fatality is sometimes so great as to cause the neglect of remedies that might be efficacious, is obvious.

ANALYSIS OF RHUBARB.—According to the analysis of Professor Peretti, who has lately subjected rhubarb to examination, that substance contains tannin, gallic acid, malate of lime, gum, sugar, fixed oil, volatile oil, resin, a solid yellow colouring matter, oxalate of lime, and fibrous matter. The ashes gave carbonate of potash, sulphate of potash, chloride of potassium, oxide of iron, carbonate and sulphate of lime, and silica. The resin is the active part of the rhubarb; according to Dr. Tagliabo, in doses of ten or twelve grains, it operates strongly, and without griping. A remarkable circumstance in the analysis of M. Peretti is the discovery of sugar, which had not been previously announced. Its presence was discovered by a process which he supposes to be applicable to a great number of cases. He boils the alcoholic tincture of rhubarb until it becomes colourless; he filters and evaporates. The sugar remains mixed with a little malic acid and gum.—*Jour. de Phar.*

CULTIVATION OF CINNAMON.—The cinnamon department of the island of Ceylon consists of from 25,000 to 26,000 people, who form

a separate cast of their own, and who are altogether employed in the cultivation of the cinnamon tree (*Laurus Cinnamomum*), and in preparing the bark of that tree for the market. The exportation of this article from Ceylon frequently amounts to 6000 bales of 80 lbs. each bale. Although the cinnamon grows wild in the south and south-west part of the island, the Dutch and English governments have thought it advantageous to have it cultivated in four or five very large gardens; one of the largest of which, called the Marandan, is close to Colombo. From the bark of the cinnamon tree, the cinnamon, which is used for culinary purposes, is prepared. It is from the same bark that the cinnamon water and the cinnamon oil are prepared; and also a very fine oil, like the oil of cloves, is prepared from the leaves, and the finest description of camphor from the roots.—*Gard. Mag.*

PRESERVATION OF GRAIN IN RESERVOIRS OF CLAY.—A German, M. Fischer, in the *Archiv für die gesamte Naturlehre*, tom. iv. No. 1, communicates the following plan pursued by him in preserving grain. He erected with unburnt bricks a square building, 28 feet on each side, and 35 feet high; the walls 3 feet thick, and the bricks well conjoined by means of clay. The floor also was formed of worked clay, and raised a foot above the level of the surrounding ground. This tub, as it were, being covered with a simple roofing, and thatched, and the brick-work completely dry, 1100 sacks of dry wheat were poured into it: the wheat was covered with straw, and over this straw was placed a layer of dry clay, a foot thick, thoroughly trodden and beaten down. Several years afterwards, on the opening of this magazine, the wheat was found dry, and perfectly good; and, what is more, is said to have possessed, for the purposes of making bread and pastry, qualities far superior to those of wheat preserved in magazines admitting air.—*London Mag.*

ECONOMY IN HORSES' FOOD.—The custom of feeding horses with coarse bread is common in France, and was introduced, unless we are misinformed, during the revolutionary wars, as more wholesome, more economical, and more portable than oats. The *Furet de Londres* furnishes the following proportions of ingredients for making such bread, as adopted by a Silesian experimental farmer:—Five gallons of oat flour, ditto of rye flour, yeast, one gallon and a half of potatoes, reduced to a pap. With the bread made from this quantity of materials he fed seven horses a-day, at the rate of twelve pounds of bread, cut into pieces, to each horse, and mixed up with a little straw, chaffed and moistened.—*Ibid.*

EVERLASTING POTATOE.—This root is ever ready to afford a supply of early potatoes, from one end of the year to the other: they are left undisturbed, except when a dish is wanted; they are not deeply embedded, but soon discovered on stirring the surface mould. The flower seems somewhat different from that of the common potatoe. They should be planted about the latter end of May; if planted sooner, they come in too early. Before frost sets in, the bed is covered with litter as a protection from its influence. They are taken

up at Christmas, as fine new potatoes, and are either suffered to remain undisturbed, or perhaps, what is still better, the potatoes are completely forked up as they are wanted, and the smallest being separated are set apart for seed, under a heap, or hillock, to be re-planted toward the close of the succeeding May. The smallest sprig of this potatoe will grow.—*Gard. Mag.*

MANUFACTURE OF WHISKEY.—It is a remarkable fact, says Major-General Stewart, in an article on the prevention of smuggling in the Highlands, inserted in the Quarterly Journal of Agriculture, that a spirit of the best quality and flavour has been distilled by men with their apparatus at the side of a burn, and perhaps changing weekly from fear of a discovery: malting on the open heath far up the hills, and hurrying on the whole process to avoid detection; yet, with all these disadvantages, they received the highest price in the market for the spirit thus manufactured. The quantity might perhaps be less than what could be produced by a more regular process of distillation; but then the liquor was so much superior in flavour and quality, as to compensate for the deficient quantity. Several of these men have been employed, by way of experiment, in a licensed distillery on the estate of Garth, with directions to proceed in their own way, only to be regulated by the laws under the control of an officer; yet, with the advantage of the best utensils, the purest water, and the best fuel, they produced a spirit quite inferior in quality and flavour to what they made under the shelter of a rock, or in a den, and it sustained neither the same price nor character in the market.—*Quar. Jour. Agr.*

LIST OF NEW PATENTS SEALED.

CULINARY APPARATUS.—To James Frazer, of Limehouse, for an improved arrangement of flues, for the communication of heated air to culinary vessels of every description.—Sealed 27th January. Two months to enrol specification.

EVAPORATION.—To John Braithwaite, and John Ericson, of the New Road, Middlesex, for a new method of converting liquids into vapour. 31st January. Six months.

CARRIAGE DRAGS.—To Robert Parker, of Hackney, Lieutenant R. N., for an improved drag, applicable to wheel carriages, to stop or retard their motion. 31st January. Two months.

WASHING, DYEING AND CALLENDERING, &c.—To Joseph Rayner, of King Square, for improved machinery to facilitate various operations connected with those mentioned in the margin. 5th February. Six months.

STEAM MACHINERY.—To Julius Pumphrey, of Tally Hill, Worcester, for improvements in steam machinery for propelling vessels. 3d February. Two months.

HATS AND BONNETS.—To Alexander Denlno, of Leman Street, Goodman's Fields, for an improved imitation of Leghorn hats and bonnets. 5th February. Six months.

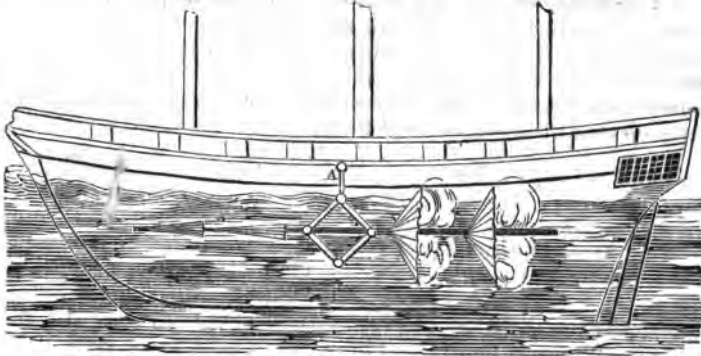
GILDING WOVEN FABRICS.—To John Burgis, of Maiden Lane, Covent Garden, for methods of gilding and silvering woven fabrics, to be used instead of gold and silver laced borderings, &c.—4th February. Two months.

MASTS.—To Richard Greep, of Blackwall, Middlesex, for improvements in the construction of masts. 5th February. Four months.

SASHES, SHUTTERS, DOORS, &c.—To W. H. Kitchen, of St. Giles's, Bloomsbury, and Andrew Smith of York Terrace, St. Margaret's, Westminster, for improvements in window-sashes, shutters, and doors, designed to afford security against burglars.

ILLUMINATION.—To William Heard, of Devonshire Street, Vauxhall Road, for improvements in the mode of producing artificial light. 12th February. Six months.

WOOLLEN CLOTH.—To Samuel Walker, of Buxton, Leeds, York, for an apparatus which he denominates an *Operamator*, applicable to dressing woollen cloths. 20th February Six months.



PISCIAN METHOD OF PROPELLING STEAM VESSELS.

TO THE EDITOR.

SIR,—If the powerful action of a fish's tail could be successfully imitated by machinery, no other propeller would be so effective. The above plan approaches somewhat to it in principle, and as I have given up all thoughts of obtaining a patent for it, I send it to your useful publication. A short description will suffice.

The piston of the engine being attached to the rod A will alternately open and shut a series of sliding sub-marine fins or fans, which may be very variously constructed, and placed either at the sides, or bow and stern of a vessel, keeping up a constant pressure upon the water, and a consequent motion of the vessel forward, without back water or splashing.

Your's, SAXULA.*

NATIONAL REPOSITORY.

(Continued from p. 212.)

47. & 48. *Specimens of Improved Pulley Blocks, by Mr. J. Bothway, R. N. of Queen Street, Plymouth.*—These blocks present nothing novel in their mechanical arrangement, and must be regarded simply as a highly improved manufacture, in which the proportions of the constituent parts being judiciously managed, and the execution of the workmanship of a superior description, their effective operation as machines is much increased. As the real practical value of improvements of this nature, can be best estimated by those who have to use them, it is with satisfaction we notice in the Transactions of the Society of Arts for 1827, several respectable testimonials in their favour, including some of the officers of the Royal Dock Yard, Plymouth, whose evidence goes to prove that they have been subjected to the severest tests, which were so satisfactory as to lead to their application to several ships of the navy.

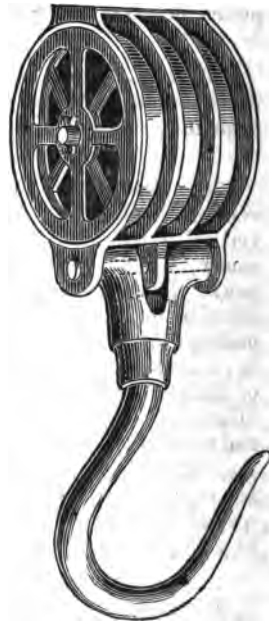
* We shall shortly have occasion to describe several *patented* inventions, which have considerable resemblance to the above admirable conception.—ED.

The specimens exhibited at the Repository consist of a jib-haulyard block, a cat-block, and other apparatus connected with them. In a letter addressed to the Society of Arts Mr. Bothway states, that in a long period of service in the Royal Navy, having observed how many valuable seamen have been lost overboard, when getting underweigh in a fresh gale, in consequence of the unwieldy bulk of the cat-blocks, he had laboured to produce something that should obviate this evil: the result of which was the improved cat-block we have to describe. The advantages which this block possesses over those in common use, are thus stated by Mr. Bothway.

"In all large class ships in the Royal Navy, the unwieldy nature of the usual cat-block requires that two men should be sent out on the anchor, a most perilous service in rough weather, whereas, mine only requires one man at any time, because he has not to sustain the whole weight of the block, as in the former case, but only that of the hook. And in vessels smaller than line-of-battle ships, in blowing weather, when the ship pitches heavily, the anchor may be hooked without the man going on it, by his standing on the head, and guiding the hook of the block to the anchor by a staff and hook, similar to a boat-hook; this facility is gained by the mobility of the swivel in its socket, so that the man has not the weight of the block to turn, in order to insert the hook in the ring of the anchor. Should the anchor be hooked in the dark, or otherwise by a turn in the fall, the hook being on a swivel and joint will come out before the strain comes on the block; and when the anchor is foul it can also be hooked with great facility. In my thirty-two years' service I have seen the wooden cat-blocks swell so much in cold climates, that the sheaves have become immovable; mine being of metal are not liable to this inconvenience."

Their strength and capability to bear a sudden jerk have been well tried; and although made of metal, they are even lighter than the wooden ones with their iron bindings, capable of the same service. The improved metal cat-block supplied to the Warspite weighs 3 cwt. 1 qr. 26 lbs. (which is large enough for first-rate ships) while the superseded wooden one weighed 3 cwt. 2 qrs. 5 lbs.; the difference arising we conceive, from a judicious reduction of the substance of metal, wherever it can be spared, which the nature of wood would not admit of.

Another great advantage may be derived from the block (cat-block) being applicable to other uses, whereas the old ones cannot; for instance, by merely having a spare socket or two fitted with



hooks of various sizes, it may take a strap for gear blocks; or it may be converted into a lashing block, without the hook and socket, but with the socket bolt.

The figure in the margin * exhibits a perspective view of a cat-block, adapted to a yacht: a nicely turned bolt passes through eyes in the upper part of the swivel socket, to which the hook is suspended; this bolt may be withdrawn at pleasure, and other apparatus suspended to the block, to adapt it to various purposes.

51. *Evolving Sash Windows*, by E. Tuohy.—See Register of Arts, vol. ii. N. S. page 206.

52. to 54. *Specimens of Patent Detector Locks*, by Charles Chubb.—Described vol. i. page 29.

55. *Patent Swivel Castors*, by T. C. Salt, Birmingham.—This is a well-manufactured table castor, but we do not perceive in what respect it differs from the principle of other castors, which are not patent; it may, nevertheless, be an improved method of *manufacturing*. It works with extraordinary smoothness and freedom from friction, owing probably to the swivel, which is very stout, being well turned and polished, and working in a suitable cavity, supplied with oil, in such a manner as to be not liable to run out. The article, considered as a manufacture of great extent, and got up at very low prices, deserves commendation.

56. & 57. *Patent Recumbent Chairs and Couches*, by R. Daws.—A description of this very admirable contrivance, given in vol. ii. N. S. page 134.

58. *Somnolential Chair*, by Morris & Son.—In the preceding invention, by Mr. Daws, the chairs are inclined at pleasure from the vertical to the horizontal position, when it becomes a full lengthed couch; which is effected by the pressure of a spring and ratchet work. By Messrs. Morris's plan this operation requires a little more exertion on the part of the person when in the chair; who has to undergo the fatigue of passing his arm outside of the right elbow and to turn a little mahogany winch, which raises or depresses the couch or chair, to any inclination between the angle of laziness and that of diligence. We like this chair better than Daws's; it is more "sure and certain" in its movements, which we were at the trouble of investigating the secret of by dissection. The said winch, be it known, has at the other extremity of its axis a bevelled pinion, which turns a small bevelled wheel at right angles to it, whose axis is connected to a long screw, which is thereby made to revolve (in fixed bearings,

* Which the engraver has shaded as if it were intended to have the present upside, down.

as an endless screw), and to cause a cross bar, through which the screw works in a nut, to advance or recede. This cross bar is connected to the seat of the chair, which being moved from the other parts, produce through the agency of several rule joints the effects mentioned. Now no pressure in the chair will cause the back of it to tumble down, as the screw cannot slip through it.

59. & 60. *Models of Improved Bee-hives, by T. Nutt, of Moulton Chapel, Lincolnshire.*—This is a very excellent and valuable invention; the cruel practice of destroying the bees to obtain their honey is entirely obviated by it, and the produce is very considerably increased by the management of the hives and their inmates. The “produce of a single cottage hive, under five years’ management on the principle of humanity” is stated by Mr. Nutt in his prospectus as follows:—

Pounds.		Pounds.
	First swarm on the 10th June, 1823	
127	Union of the parent stock, .. 14th August, 1823 ..	28
162	Collection of honey 12th June, .. 1824 ..	30
100	 16th July, .. 1825 ..	58
115	 10th August, 1826 ..	106
98	 10th July, .. 1827 ..	219
104	 6th August, 1828 ..	296

712 For the bees’ support during five years. *Contribution 737
737 Contribution.

1449

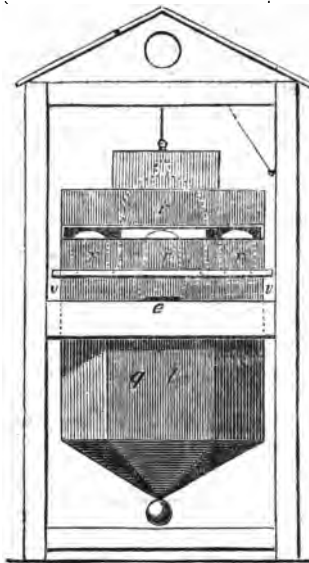
“Not a bee was destroyed; one and the same domicile was stationary; and these interesting insects are now so tractable and domesticated by this humane management, that no danger is apprehended by the curious who may make their remarks and hourly observations at the back window of this establishment. In fact this apiary strictly conforms to the call of nature, and there is no obstruction of the movements of these indefatigable creatures whilst yielding their treasured sweets unadulterated and as pure as the crystal stream. *The Pavilion of Nature* is so conveniently constructed, that no part of the brood, combs or pollen can possibly intrude itself into the magazine of treasured honey.

“1192 pounds of fine honey have this year been taken from six apiaries, under the same mode of management: and the certificate of this fact, together with the model of an apiary, and glasses of the pure honey, are now before the National Repository, London.

“The beautiful appearance of these apiaries, when at full work, needs no comment; it speaks volumes of facts, which cannot be found in the pages of ancient or modern theory. And the long and persevering industry after the cause of these matchless creatures, has at length brought about their perpetual welfare; their natural movements have been accommodated, their convenience has been consulted, and

their works facilitated. This has been the cause of the extraordinary gathering. There is no swarming, no tinkling of the pan. Every day of the gathering season are these indefatigable insects employed for the mutual aid and benefit of the society to which they belong. The first bud of the season and the last flower of the field will be visited by these noble insects, if the weather is fine and propitious. They have under this mode of management abundance of room, and are under the same agreeable temperature during the summer gathering."

The most essential part of the management of the bees, according to this plan, consists in regulating the heat of the lives by means of ventilation, so as to prevent their swarming; at the same time obliging them to exchange a hive filled with honey for an empty one joined on by the side of it.

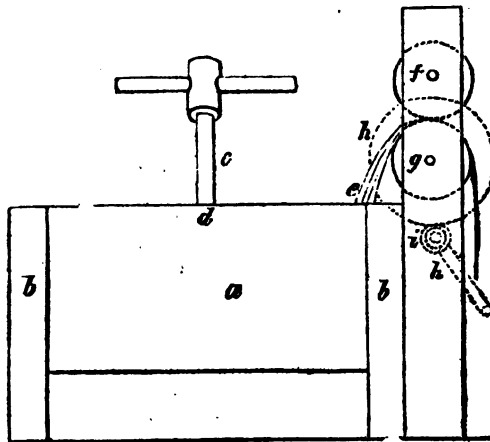


The cut represents an elevation of one of the forms of hives adopted by Mr. Nutt, inclosed in a frame like that of a watchman's box, but surrounded by trellis-work (not shown) instead of close boards. The lower portion *q l* being the warmest, is the apartment for the queen and the larva. The entrance for the bees is at a narrow hole at the back of the hive, as at *e*, near to the ventilators *v v*, which are tin tubes open on the outside of the hive, and perforated internally with minute holes (to prevent the bees passing through) projecting horizontally towards the centre of the hive; above these is a floor with large apertures, shown by the dots, which are covered by the receptacles for the honey, *r r r r*, into which the bees, therefore, enter from underneath. The compartment of the hive where these vessels are placed is made to open and shut as a box, the lid of which is shown

in the cut as opened an inch or two, and so retained by a cord and pulley.

Our space does not permit us to extend our remarks upon this subject; those of our readers therefore, who wish for more information with regard to Mr. Nutt's management of bees, may procure it of him, or of his agent, Mr. Garritt, of 25, Houndsditch.

61. *Patent Washing Machine, by E. K. Bullman, of Leeds.*—This is a capital apparatus. We do not, however, perceive any thing new in the contrivance of the *washing* machine, distinctly considered, but there is added, immediately contiguous to it, a *wringing* apparatus, by which the clothes when washed are pressed nearly dry when taken out of the tub. The act of wringing, as it is well expressed, according to the usual method, is a very destructive process, especially to fabrics of a delicate texture. We took no sketch of this machine, but the following diagram will afford some idea of the principal arrangement.



a the vessel holding the clothes and water, with a circularly-curved bottom, and standing upon legs *b b*; *c* the washer of the usual construction, to which is given a forcible oscillating movement by means of the cross handle turning on a centre or fulcrum at *d*; *e* represent some clothes being taken up out of the vessel *a*, by means of the rollers *f g*; the axis of *g* carries a toothed wheel *h*, operated upon by a small pinion *i*, by turning the winch *k*. The rollers are provided with suitable apparatus to adjust them to the required pressure, and they are covered with a turn or two of flannel. The whole machine being of excellent and stable workmanship, it is, without doubt, calculated to perform well, and to reduce manual labour in a considerable degree. The patentee states that by the use of the wringing apparatus the linen will wear twice as long as when wrung in the usual manner.

The patentee has given the following printed directions, for the use of the combined washing and wringing machine, which we insert, as it may possibly contain some useful information.

"Put all the linen into clean *cold water* the night before the washing, so as to remain there a few hours. *Take care not to put any soap to them in this operation.* It is ascertained beyond a doubt, that it will fasten the dirt in instead of loosening it.

"Next morning let all the things be gently wrung out by the hand, lay them on a table, and soap them, taking care to rub the soap well into the creases and dirty parts; then put them into the machine loosely, and equally distributed, (*but not folded*), and so disposed that the pressure may bear equally on all parts of the linen. In the following proportions:—for a small machine, six shirts (three on each side), or two large sheets (one on each side): and, for a large machine, ten shirts, or two pairs of sheets, (disposed in the same way); *and not more than these quantities.*—Take care the machine be not filled too full, else the presser cannot work free. Then put in two or three pails full of *boiling hot water*, and immediately put on the covers, to keep in the heat as much as possible, and, standing at the flat end of the machine, take hold of the cross handles, and work it with a slow regular motion about ten minutes, bearing a moderate weight on the handles at each stroke of the presser. Every time the linen is removed, it will be found more convenient first to lift out the presser, which is left loose for that purpose.

"To second the linen, observe the same process as above-mentioned; only, as is usual, turn the body linen, and work the machine a few minutes, being careful to keep the water clear, adding soap, sufficient to raise a lather. Lace, and small articles of linen or muslin, may be put into a fine mash net, loosely distributed the whole length of the machine. Not more than one large counterpane or blanket should be washed at one time, and it must be placed over the spindle on each side of the presser, shifting it once or twice as may be needful.

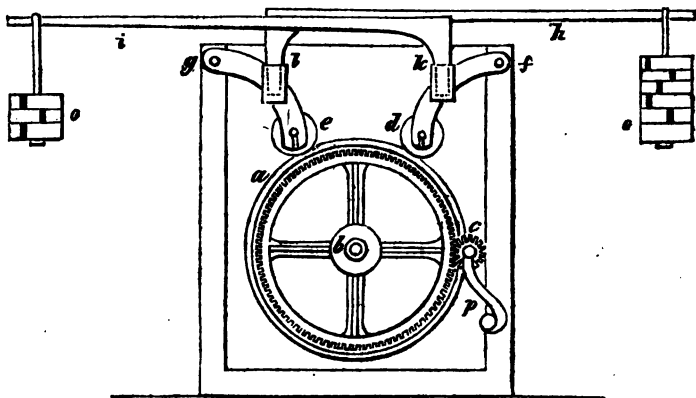
"The use of the wringing apparatus will immediately show itself: it is only necessary to observe, that if the linen be put through with regularity, its efficacy will be in the same proportion greater. In blueing the linen, its advantages will be very apparent, and more especially, if used by any one exercising the least discrimination; that is to say, if the larger things are neatly folded into three or four; depending on their size, and put quite flat through the machine, it is perfectly astonishing to see how beautifully dry they come out; this will also be found to save a great deal of trouble in pulling out and folding the linen afterwards.

"If the water be not used quite boiling hot, these directions will be of no use, nor will it give to the machine the full effect it is capable of producing; but, by a strict attention to this point, the least possible trouble will be requisite to remove entirely every particle of dirt from the very dirtiest places, without having so violently to scrub the linen, which so much wears it. Heads of families would do well to see after this being attended to, and if the whole of the directions herein given

be closely followed, they will very soon see an improvement in the colour of their linen, which will amply repay them for any attention they may have bestowed.

"Where the linen has become a bad colour, either from age, from repeated drying in large and close built towns, or from the want of exposure to the sun and air upon the grass, let it be steeped for some time before it is washed in a solution of oxymuriate of lime. Let it then be boiled in an alkaline ley; linen or cotton by this means will not become yellow by age, but will always be kept as pure and as white as country washed linen."

62. *An Improved Mangle, by Brook and Webster, of Thornhill, Yorkshire.*—This mangle is of a novel form, the manner of giving the pressure is efficient, though not so convenient as it might be made. The annexed sketch will convey to the reader the principle of its construction, but being executed after seeing the little model of it in the Repository, it is not very exact, perhaps, in its minute details, which is, however, of no importance.



a is a drum or cylinder, to which is fixed the toothed wheel *b*, moved by the pinion *c*, when the latter is turned by the winch *p*. *d* and *e* are two rollers, round which the cloth to be mangled is wrapped; these rollers are placed in the curved arms shown, which turn upon centre pins at *f* *g*; *h* and *i* are levers, the bended ends of which fit into sockets *k* *l* in the curved arms; *o* *o* are weights suspended to the levers to give the pressure, which can be increased or diminished at pleasure, either by altering the actual quantities of the weights, or changing their situation on the levers.

In order to remove the clothes from either of the rollers, or to put others on, the weights must necessarily be taken off the lever, the lever may then be taken out of its socket, or be lifted up along with the curved arm which turns upon its jointed end, and be thrown back together.

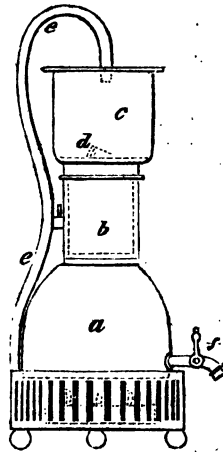
It is proper to notice that our sketch differs from the model in these respects: in the model the levers are of a weak form, and they are rivetted to the curved arms, being thus made to turn over together; the weights are the common scale weights. Some convenient and quick mode of taking the weights of the levers should be adopted to render the machine altogether eligible; and there are so many obvious ways of effecting this, that we shall not occupy ourselves with describing them, not doubting that the ingenuity of the patentees will take the hint, and apply the most judicious.

It will be noticed that this mangle is a very compact one, occupying the space of only a small table, to which use it might be applied when not otherwise employed.

63. *Patent Self-acting Coffee Pot, by S. Jones, of 201, Strand.*

—We are fearful that this apparatus partakes more of the character of an ingenious hydraulic machine, suited to the preparation of *decoctions*, than the making of a good cup of coffee, which is best obtained by simple *infusion*.

a is a vessel placed over a lamp furnace, into which the requisite quantity of water is put; *b* a double vessel, the external one open at the bottom, and the internal, a finely perforated metal cup to hold the ground coffee: *c* is another recipient fitting over *b*, and having a valve at *d*. When the water in *a* boils, the steam ascends amongst the coffee in *b*; the ebullition being continued, the steam accumulates, and pressing upon the surface of the water, causes it to ascend the pipe *ee* into the vessel *c*; herein the water rests until the pressure of the steam underneath shall have opened the valve *d*, when it discharges itself on to the coffee contained in the vessel *b*; the water then percolates through the coffee, and runs back into the vessel *a*; the latter will now contain a mixture of the decoction of coffee with plain water; this being very dilute, the operation is continued, by causing the new product to ascend the pipe, and pass through the coffee, until the decoction is obtained of the desired strength, when it is to be drawn off for use by the cock *f*.



We suspect that, owing to the continued boiling and vaporization of the contents of the vessel *a*, the volatile aromatic principle of the coffee will escape through some of the crevices between the vessels, where they are connected to each other. We likewise apprehend, that the long continued application of heat to the coffee in the intermediate vessel, at or above the boiling temperature, will be productive of an extract, neither agreeable to the palate, nor wholesome to the stomach.

For the making of *decoctions* the invention is admirably adapted,

and the process is truly elegant. If it should happen that we are in error with respect to its eligibility for making *infusions*, we shall be happy to be made sensible of it, and to acknowledge it.

* * Since the above was prepared for the press, we find that we were misinformed with respect to the patentee's mode of operating with his coffee pot. He does not boil it, but simply makes an infusion, by discharging all (or nearly all) the water upon the coffee; then blows out the lamp (of naphtha or spirits of wine), when the infusion is perfected, by the filtration of the liquid through the body of the coffee, and the finely perforated strainer. The invention now appears to us unexceptionable, and extremely convenient.

64. *Improved Peripurist Cooking Apparatus*, by Tozer & Son, of 20, Henrietta Street, Covent Garden.—In our last volume we described this highly-ingenious and economical invention; and we observe that they are now improved both in elegance and convenience.

65. *Specimens of Water-proof Pipes*, by F. Hancock, of Fulham.—The specification of the patent of these novel and useful tubes, is given at page 196, vol. i. N. S.

66. *Patent Apparatus for entering Places filled with Smoke or noxious Vapours, without danger of Suffocation*, by C. Deane, of 2, Charles Street, Deptford.—The regular readers of this work will recollect our having, in the account of the numerous fire-escape machines exhibited at a recent meeting of the Society for Saving Life from Fire, promised to describe this invention in the following N^o.: but having noticed subsequently that a complete apparatus of the kind was deposited in the Gallery of the National Repository, we deferred the description for a week or two, until we could introduce it in our regular account of the articles exhibited at this Institution, which we now proceed to do without the aid of drawings, as they are not strictly necessary.

The apparatus consists of a large helmet, with a leathern garment attached to it, which is to be put over the head and shoulders of a person about to enter an apartment on fire, or that is filled with noxious vapours. From the back of the helmet proceeds a long flexible pipe, which extends to the outside of the building or apartment, and through which fresh air is propelled into the helmet for the wearer to breathe, by means of properly-constructed bellows, conveniently fixed for operating upon in a wooden box; which box is adapted for the stowage of all the apparatus when not in use, and is sufficiently portable. At the back part of the helmet there is another pipe, kept distended by an internal coiled wire spring, which reaches only to the ancles of the wearer, and is strapped to one of his legs, to prevent inconvenience from its dangling about. The whole of the apparatus must of necessity be air-tight! The helmet is made of copper, nicely rivetted, soldered, and tinned on the inside: the lower

part of the helmet is a padded collar, to press close upon the neck and shoulders of the wearer, without impeding respiration; and to this collar is attached the garment; (which should be rendered as fire-proof as possible) the upper part being confined by a belt passing round the body, and the lower by straps at the arms and legs, so as to prevent the entrance of deleterious vapour.

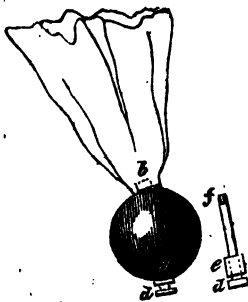
In the front part of the helmet there is a strong glass window, of a breadth sufficient for both eyes to look through. The pipe which conveys the fresh air has a rope passed through it, to prevent the air from being cut off to the wearer by its becoming collapsed, or compressed flat by the shutting of a door; and this pipe opens into the helmet, where it is made double, in order that the cold air injected by passing a thin broad stream in front of the helmet just above the glass, which prevents the moist vapour from the breath of the wearer becoming condensed against the glass, and obscuring his sight.

The other pipe for receiving the air expelled from the lungs is connected to the back of the helmet; this pipe has a bell mouth at its lowest extremity, which being near to the floor of the apartment, where the air is comparatively pure and perfectly respirable, no danger can arise from its being left open. In the front of the helmet opposite to the mouth, there is a slide valve, to permit the wearer when occasion requires, to speak to persons on the outside of the building.

The apparatus likewise embraces a lanthorn to be affixed to the front of the dress, and suitable implements for breaking into apartments, with which the wearer would be equipped in exploring a building on fire, and could use vigorously, in spite of fire, and smoke, and sulphur, and be thereby often enabled to rescue persons and property which would otherwise be irrecoverably lost.

67. *Percussion Hand Grenade, by Captain Norton, (34th Regt.) Cork.*—This invention is stated to be intended as a defence for houses against robbers; but it certainly affords a terribly *offensive* mode of make a *defence*; one, bye-the-bye, which women and children may employ quite as effectually as men. They must be stout robbers who would face the descent of a second projectile of this kind.

It consists of a hollow cast-iron ball *a*, about 3 inches diameter, which is nearly filled with combustible matter, by a hole at bottom; through this is put an iron or steel bolt *f d*, the extremity of which is mounted with a percussion cap and powder *f*; a cork *e*, is also put on to the bolt near to the head, which holds the bolt projecting a little way out of the hole, and the percussion cap out of contact with the interior opposite side of the shell. A sheet of brown paper, or a piece of common cloth, is tied to a button on the outside of the shell, which forms the handle to throw it by,



(out of a window for instance) and guides its descent, so that the head of the bolt will infallibly strike against the ground; the percussion cap is thereby forced against the interior surface of the shell, which instantly explodes.

PATENT IRON SHEATHING FOR SHIPS.

By G. S. PATTISON Esq. of Old Burlington Street.—Dated Jan. 1829.

THE rapid corrosion and annihilation of the copper sheathing of ships, has of late years attracted the attention of our most enlightened chemists, to devise some means of preventing it. Sir H. Davy having discovered that the action of sea-water upon copper was of a galvanic nature, placed small pieces of tin and zinc, in contact with its surface, which had the effect of preventing the oxidation of the copper, owing to its being thereby rendered negatively electrical. Ships were sheathed on this principle, and sent to sea, but they proved such positive bad sailers, that a negative was soon put upon the scheme. It is true, that the copper was protected by the zinc, from the corroding effects of the sea-water, but in thus getting rid of one enemy, it introduced a greater, in those crustaceous beasts, the barnacles, which made the good ships Lightning and Swiftsure, (as Jack would say) move through the water like the stumps of trees.

In copper sheathing that is unprotected, the loose state of the particles of the oxidated surface, either prevent the shell-fish from sticking fast, or the oxide operates as an active poison to keep them off. We have observed the copper of a ship's bottom to be quite clean after a voyage, while the heads of the *cast-metal* nails, have had a barnacle stuck upon each of them, as if they had been placed there by art, as ornamental white studs upon a green ground. These nails being in fact an *alloy of copper*, made with *tin* and *zinc*, the adhesion of the barnacles is accounted for. On the contrary, when nails made of *pure copper* are used, we have observed that the barnacles shew a decided aversion to them. Had Sir H. Davy observed this fact, instead of ourselves, he would immediately have decided upon the utter inutility of the ingenious scientific experiments that have been made under his directions.

Founded upon the same theory of the galvanic influence, it has been reported, that a truly important discovery has been made; namely, that *iron* will not corrode, when "protected" in a similar manner to the copper by zinc, and that a ship sheathed with iron and little bits of zinc, had been at sea for two years, returning home with a clean and even bright surface. The discoverer is an American, who has communicated it to Professor Pattison, and the consequence is a patent for these kingdoms, the specification of which we have perused, and here annex the substance of.

The proposed improvement consists in substituting sheets of iron with plates of zinc, attached thereto by rivetting or soldering, for the copper usually employed. The iron plates may be of the usual dimensions of the copper plates, and for each area of 100 inches in the iron, a plate of zinc, of from $\frac{1}{4}$ to $\frac{1}{2}$ inch thick, equal to 5 inches in

area, is attached to the lower extremity of the sheet, so that in sheathing the vessel from the upper part downwards, each succeeding sheet of iron shall be in contact, by lapping over with the zinc plate of the sheet immediately above it. Plates of zinc must also be attached to the inside of the sheet of iron, bearing a proportion in area to those on the outside of 3 to 5. The spikes and bolts by which the sheathing is fastened to the vessel, are each to be furnished with a disc, or washer of zinc, fitting closely to the head, and it is recommended that they be driven *well home*, to ensure perfect metallic contact. The nails employed are to be made concave under the head, and the cavity is to be filled with melted zinc. The proportion of 5 square inches of zinc to 100 of iron is not insisted on; any greater proportion will be equally effectual, and the zinc may be alloyed with copper, tin, or lead, in the proportion of from 3 to 10 per cent. By this mode of sheathing vessels, it is asserted that the corrosion or oxidation of the metal will be nearly, if not effectually prevented.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from p. 218.

THE peculiar construction of furnaces we have next to describe, was invented by Mr. William Losh, of Newcastle-upon-Tyne; the patent for which, bearing the date of April 8, 1815, will consequently expire in a few days, and be then *open to the public, for their unrestricted use*. The advantages attending the adoption of the plan have been well attested; and in the examination of Mr. Losh on the subject, by the Committee of the House of Commons, in June, 1819, that gentleman stated, that in several engine furnaces erected according to his plans, the smoke was *entirely* consumed.

The principle upon which the mechanical arrangements are founded, consists in the application of the caloric evolved during the combustion, free from the cooling influence of any cold undecomposed air, in a sudden and equable manner, to the bottom of the boiler, or other vessel.

The plan consists in placing the furnace-bars as near as possible under the middle of the boiler's bottom, and to have the aperture or apertures for the escape of the rarefied air and smoke, above the door through which the fuel is put in; so that the heated air and gases, by their expansive force and diminished specific gravity, shall prevent the cold air of the atmosphere from penetrating beneath the bottom of the boiler, in order that the cold air admitted at the door where the fuel is introduced, shall, in its passage to the chimney, have no tendency to mix with the heated gases, until after they have ceased to act upon such parts of the boiler, as are required to be subjected to their action alone. A division of cast-iron plates extending from the ends of the bars next to the door, separates the grate-room from the ash-hole and air-duct, and prevents any air from passing into the grate-room which does not pass through the ignited fuel.

It is evident, that if cold air be permitted to have access to the bottom of a boiler, a larger fire, or an increased consumption of fuel will be requisite, to produce a given effect : and thus to maintain the steam at a sufficient expansive force to work an engine, an intense heat is applied, sufficient to flux the fuel into slags, and sometimes even to fuse the bars ; but when this last effect does not take place, the temperature of the bars is usually so high, that the atmospheric air coming in contact with them, rapidly oxidates their surfaces, which fall off in successive scales, until the whole substance of the metal is corroded away.

An advantage therefore results from Mr. Losh's excluding the cold atmospheric air, which obviates the evil consequences just mentioned attending its admission. The position of Mr. Losh's fire-places likewise enable a more effectual support to be given to the bottoms of the boilers, (an object of great importance when of large capacity) than is practicable by the usual mode of setting them.

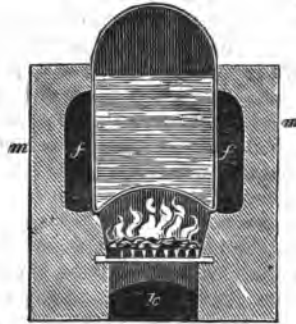
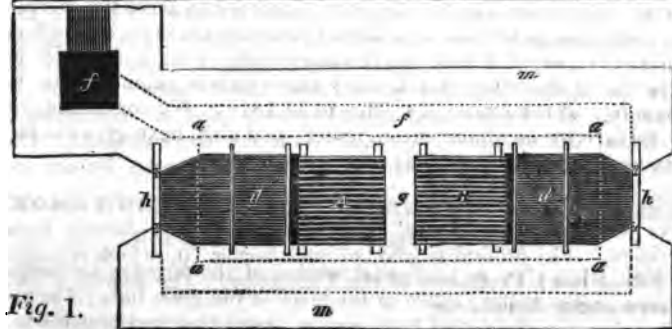
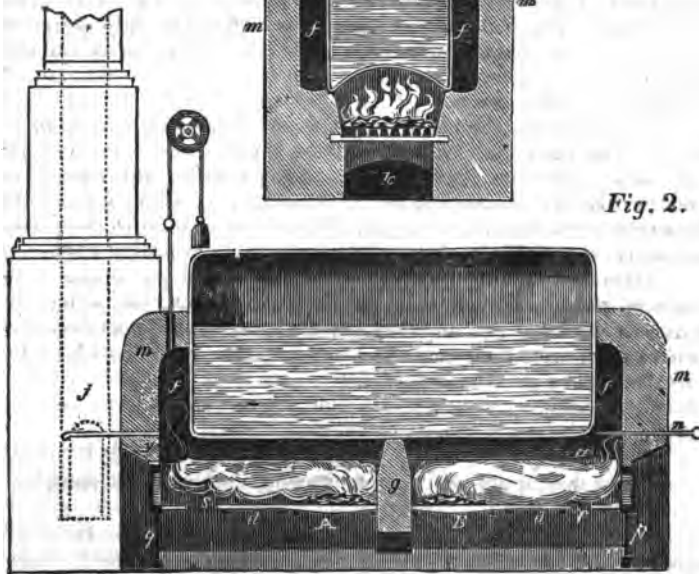
According to this plan, the caloric and heated gases ascend and radiate from the burning fuel, and impinge against the boiler with extreme velocity, and intensity, as they meet with no substance to direct them from their course, or to which they can impart a portion of their heat ; an economy of fuel seems to be a necessary result, from this arrangement, while it affords a very expeditious means of getting up the steam to start an engine.

The specification of Mr. Losh's patent is very voluminous ; besides, a description of eighteen drawings, which accompany it, he enters largely into the theory of the subject, gives a history of his experience, his views, and his opinions, contrasting other plans with his own, which last are in all respects, of course, the acme of perfection. This document is obviously intended to serve the purpose of an advertisement, but from the talent and great experience of the writer, it is, nevertheless, worth the reading. Our space will not permit us to describe only those plans which he submitted to the Committee of the House of Commons in 1819. We commence with his furnace for an oblong steam boiler, and shall next give his form of furnace for sugar pans, and other vessels.

LOSH'S PATENT FURNACES FOR CONSUMING SMOKE UNDER AN OBLONG STEAM BOILER.

FIG. 1 is a plan or horizontal section of the furnaces for heating a steam engine boiler, taken at the level of the grate bars ; the area included within the dotted lines *a a a a*, shews that part above which the boiler rests when put upon its seat ; *A* and *B* are the respective grate bars of the two furnaces ; *d d*, the flooring plates which prevent the air from penetrating from the ash-pit into the grate-room, except through the grate bars and burning fuel ; these plates are supported by several bars in case they should by accident crack ; *h h* are the fire doors and frame, *g* the partition which separates the two furnaces, and supports the bottom of the boiler ; *f* the base of the chimney.

Fig. 2 is a vertical and longitudinal section of the boiler and brick-work, and furnaces ; the letters in which refer to the same

Fig. 3.**Fig. 2.****Fig. 1.**

parts, as shewn in the plan. *g* the division between the two furnaces *AB*, *dd* the flooring plates, below which are the ash-pits. The direction of the flames from the combustion of the fuel in the grates show the course they respectively take to the flues *ff*.

Fig. 3 is a vertical, and transverse section of the boiler, brick-work, &c., the letters of reference applying to the same parts as in the other figures.

N. B. Where it is of great importance to save fuel, it would be

advisable to save register dampers on the ash-pits, by which the admission of the air might be regulated in the exact ratio required to keep up a due combustion of the fuel in the furnaces.

In order to burn the smoke effectually, it is to be made to penetrate with the atmospheric air through the burning fuel, by having dampers at *x* and *y*, (the apertures of the furnace *B* and *A* into the flues) perforations are also to be made through the flooring plates at *r* and *s*, with corresponding covers and doors, or registers, on the ash-pits at *p* and *q*.

Suppose the fires to be burned bright, and that furnace *B* requires a fresh supply of coals; shut the damper *x* and open *y*, draw the cover of the perforator at *r*, and keep *s* shut; shut the ash-pit door, or register *q*, and open *p*. Then must the soot which sublimes from furnace *B* pass into the ash-pit through *r*, and be carried with the current of atmospheric air, which enters at *p*, through the opening in the wall *o*, to the furnace *A*, where it will penetrate through the grates and fuel, and be converted into gaseous products. By reversing the operation of the damper, the dense products of furnace *A* may be consumed by *B*. When the smoke ceases to sublime, the furnace can in a few seconds, be made to act as described above, by which there is a great saving of fuel.

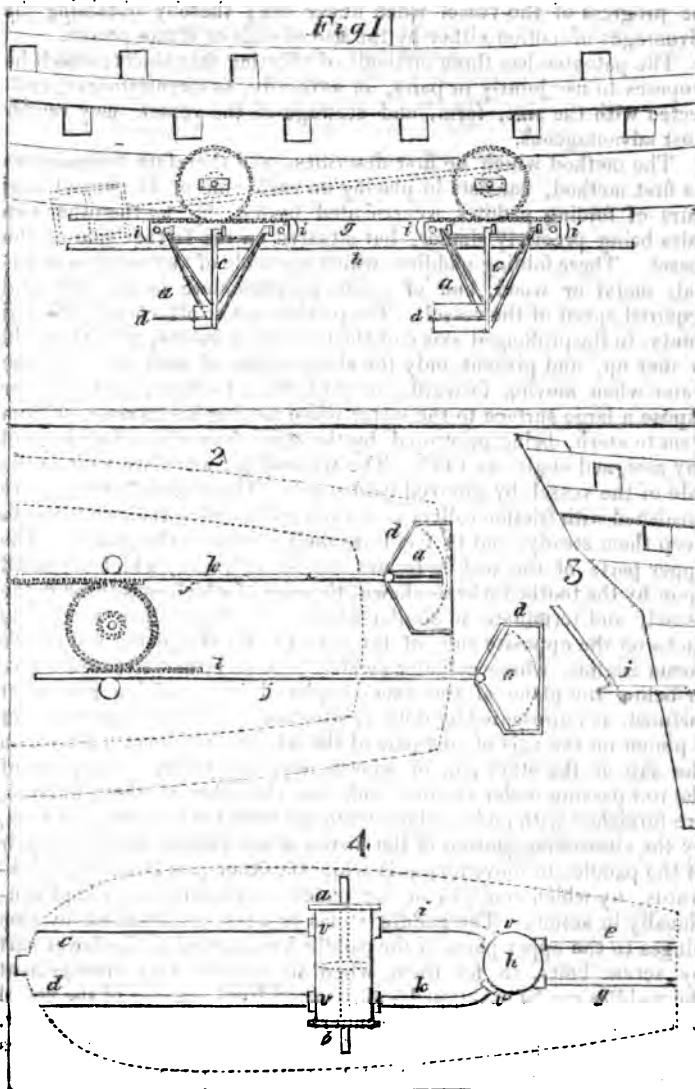
To be continued.

PROCEEDINGS OF SCIENTIFIC INSTITUTIONS.

LONDON MECHANICS' INSTITUTION.—March 20, Dr. Birkbeck gave his third lecture on the application of machines to manual labour, when he took occasion to exhibit a fire-escape invented by Mr. Taylor many years ago, in all respects similar to Mr. Doyle's, described in the previous lectures, and in a recent number of this work. On Wednesday the 24th. Mr. Dakin gave his second lecture on Voltaic Electricity. On Friday next, Dr. Birkbeck, and on Wednesday, Mr. Dakin, will continue their courses on the above subjects. On Friday, the 10th of April, Mr. Hemming will give a lecture on Pneumatics.

AN OXFORD MECHANICS' INSTITUTION—has at length been established. The present number of members is 70, which includes two distinguished Professors of the University. The members find lecturers among themselves.

SOCIETY OF CIVIL ENGINEERS.—The preservation of iron from rust was the topic of discussion on the 3rd of March. Mr. Clegg stated, that coal tar formed an effectual preservation to iron gasometers. Mr. Farey explained the principle of the common method of preserving iron, by dipping it when at a dull red heat into water, and immediately into linseed oil. The first part of the process frees it from the scales and extraneous matter, and the remaining heat disposes it to receive the oil, which forms a varnish, and filling up all the minute interstices of the surface, prevents the formation of any fresh film of oxide.



PATENT IMPROVEMENTS IN PROPELLING VESSELS.

By JOHN MELVILLE, Esq. of Upper Harley Street.

These improvements are intended to apply to the propelling of vessels by steam or other power, in a direct line, in such a manner that the propelling apparatus shall be little or no impediment to

the progress of the vessel when under sail; thereby obtaining the advantages of motion either by the use of sails or steam power.

The patentee has three methods of effecting this object, which he proposes to use jointly in pairs, or severally, as circumstances, connected with the size, form, and stowage of the vessel, may render most advantageous.

The method which he first describes, and therefore denominates his first method, consists in placing on each side of the vessel two pairs of folding paddles, represented by *a a*, fig. 1; the other two pairs being precisely similar, but situated on the farther side of the vessel. These folding paddles, which are made of any suitable material, metal or wood, and of a size proportionate to the size and required speed of the vessel. The paddles are so attached by hinged joints, to the prolonged axis *c* of the traversing frames, that they fold or shut up, and present only the sharp edges of their hinges to the water when moving forward, or from stern to stem; and open or expose a large surface to the water when moving backwards, or from stem to stern, being prevented by the stops from expanding beyond any assigned angle, as 145° . The traversing frames are kept to the side of the vessel by grooved guides *g h*. These paddle frames are furnished with friction rollers *i i* at their ends, and at their middles, to keep them steady, and to facilitate their motion in the guides. The upper parts of the paddle frames consist of racks, which are acted upon by the toothed wheels shewn, the axes of which pass through the vessel, and terminate in similar wheels, which act upon traversing racks on the opposite side of the vessel. To the piston rod of the steam engine, whose cylinder (which may be either situated above or below the plane of the axes) is placed in a position somewhat inclined, as represented by dots, is attached a rod which passes under a pinion on the axis of one pair of the wheels, and over a pinion on the axis of the other pair of wheels, and vice versa. The parts of the rod passing under the one and over the other of these pinions, are furnished with racks, whose teeth act upon the pinions, and thus, by the alternating motion of the piston of the engine, cause one pair of the paddles to move forwards while the other pair is moving backwards, by which one pair of the paddles on each side is kept continually in action. The paddle stems or axes are attached by stop hinges to the upper parts of the paddle frames, and to the lower part by screw bolts, to fix them when in use, by this arrangement the paddles can be unshipped and removed from the side of the vessel whenever the state of the wind renders their application unnecessary.

The second method consists in attaching similar folding paddles to the ends of two or more rods projecting through stuffing boxes, under the water line, in the stern of the vessel. These projecting rods, represented by *k l*, fig. 2, are made of metal, and turned cylindrically, are connected with the piston of a steam engine through racks and pinions, in a manner similar to the connection of the paddle frames before described. The intention of the wheel and pinion, the former acting on the racks connected with the projecting rods, and the latter being acted upon by the rack connected with the engine

piston, becomes necessary to obtain a greater velocity in the paddle than could be given to the piston of a steam engine. The projecting rods have rule joints at the extremities nearest the vessel. When one of the screw bolts is withdrawn, and the rods being detached from the rack, then pushed out beyond the usual extent, and the end to which the paddle is attached elevated to admit of the paddle being easily detached, the rod is to be let down and withdrawn, till it is all within the vessel except its end, which must be left in the hole or stuffing box to prevent leakage, so that with this application there need be no exterior appendages, except when the paddles are in action. Fig. 3 is explanatory of this operation.

The third method consists in employing a double acting pump, represented *a b*, fig. 4, which receives the water by the supply-pipes *c d*, furnished with valves *v v*, opening inwards, and conveyed through the pipes *i k* to the air-vessel *h*, where the valves *v v* prevent its return, and it is then discharged with increased velocity through the eduction pipes *f g*, whose apertures at the stern of the vessel are diminished in proportion to the velocity required, and have the form best adapted for the discharge of fluids.

The piston rod of the pump which passes through a stuffing-box at each end of the cylinder, is connected with the piston rod of the steam engine, the cylinder of which is in position parallel with that of the pumps.

Supposing the pump piston moving in the direction from *a* to *b*, the water will be received into the cylinder through the supply pipe, *c*, and the water which had been previously admitted into the cylinder through the pipe *d* is forced through the pipe *k* into the air-vessel, and thence through the eduction pipes.

The patentee being aware that attempts had been made by others to apply folding paddles as well as the issue of water through pipes, does not claim the exclusive use of these means but simply his improvements in the employment of them which we have described.

NEW METHOD OF APPLYING HEAT.

Patented by Messrs. BEALE & PORTER.

WE called the attention of our readers to this most important patent, in the 26th, 41st, and 42nd Numbers of our present series. Since then the invention has been making its way into practical use, with results which more than justify our favourable opinion of its merits.

We have recently had opportunities of witnessing its operation in various processes, and think we cannot do a more acceptable service to the numerous and important classes of manufacturers who employ the agency of heat, than by a brief statement of some of the advantages which are found to attend the employment of Messrs. Beale and Porters' highly ingenious plans.

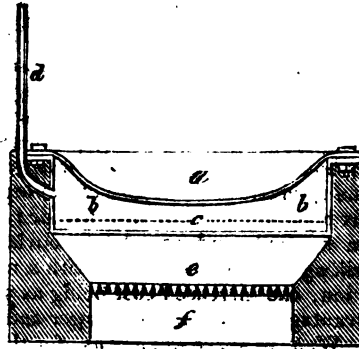
It would be needless to explain, here, the principle embraced by the patentees, such having been fully detailed in our former description, which also points out many processes wherein that principle

will be most peculiarly beneficial. Among these we instance the preparation of various medicines, which, if not commercially, may yet be deemed morally, of the highest importance, inasmuch as the knowledge and skill of medical practitioners are frequently thwarted by the inferior qualities of the medicines administered. This inferiority it has hitherto been found impracticable wholly to avoid, even by the greatest carefulness; while the *varying* amount of injury imparted to drugs when under process, occasions the greatest uncertainty to attend their use, it being manifestly impossible for the practitioner to regulate the doses prescribed, with reference to their degree of efficiency. Medicines prepared with apparatus constructed upon Messrs. Beale and Porter's patent principle, are not liable to this objection, their qualities proving of one uniform standard, and retaining, in the fullest degree, all the peculiar properties of the articles from which they are derived. We state this upon the concurrent testimonies of several most highly respectable establishments who are using the patent, for it cannot be supposed, that we ourselves are sufficiently good judges of the qualities of drugs. We may, however, remark, that the difference between articles manufactured by the patent process, or by the usual mode, is sufficiently apparent to strike the most cursory observer. We have visited a large establishment, which affords an opportunity of forming comparative estimates of these results. Contiguous to one of the patent apparatus', an evaporating pan of about 40 inches diameter—is a pan of the same dimensions of the ordinary construction, and the working of these two vessels has determined satisfactorily the question of comparative economy. One bushel of coals having been weighed and set apart for use under each pan, that on the patent principle was found to occupy *double* the number of hours in its consumption, while the evaporation per hour was *decidedly greater* from it than from the common pan. The importance of this fact, where the principle may be applied to works of magnitude, needs no comment, and would, even in the absence of the other great advantages of the principle, ensure its adoption, in times when competition has cut down the rate of profits to its minimum, and economy, whether in the state, the manufactory, or the kitchen, has become the order of the day. This economy, however, is not confined to the lessened consumption of fuel, but results also from the abridgement of labour, the process requiring no further attention than that of an un instructed labourer, occasionally to examine the fire; whereas, in similar processes, it has hitherto been necessary to employ the unremitting watchfulness and labour of a skilful operator, in order to prevent the total spoiling of the article.

The diagram here given, will shew the great simplicity of the plan, and the little chance there is of injury to the apparatus from the fire, as it comes in contact only with a surface always protected by a fluid, which rapidly absorbs and carries off the calorific.

a, the evaporating pan; b b, the outer pan, containing c, the fluid medium, represented by dotted lines, and which, for the purposes here described is a modified product by distillation of coal tar,

which furnishes vapour at the fixed degree of 350 deg, Fahrenheit; *d*, the breathing pipe, which, in the event, of injudicious firing, will serve as an outlet and condenser, for such portion of the vapour as may not otherwise be condensed by the comparatively cold surface of the evaporating pan *e*; *e*, an ordinary furnace; *f*, the ash-pit.



With apparatus thus constructed, it is found that a sufficiently rapid effect can be kept up, with the ash-pit door closed.

The patentees have sent some, and are preparing other apparatus to be employed in the manufacture of sugar in the West Indies. If reference is made to our number 26 of our 2nd volume, it will be seen in what respect a principle, which ensures the equal application of moderate and regulated degrees of heat, must be beneficial in this very extensive and important manufacture. The greatest liability to injury of the cane-juice does not arise until the latter part of the process, when the syrup has been considerably concentrated, although some evil, doubtless, accompanies the application of high degrees of heat throughout the operation. For this reason it has been proposed, in the first instance, to apply this principle only to the last vessel, technically termed the *striking teach*, into which the syrup is introduced in a very advanced stage of the process; and there can be no doubt that any method which shall complete the concentration of the saccharine matter, without the employment of undue degrees of heat, will ensure not only a better, but also a larger crystalline produce; molasses being principally, some say entirely, occasioned by excessive heating. We remember to have seen detailed in the "Annals of Philosophy," some experiments of Dr. Prout, proving that sugar is injured by the employment of 400° Fahrenheit; whereas, in the West Indies, the fire, which is made under the striking teach, and supplies heat thereafter to the vessels used in succession, must have a temperature of some thousand degrees. As a necessary consequence, the produce consists of, at least, one-third molasses, and the crystalline sugar is injured both in colour and flavour. The evil is felt and acknowledged by every practical sugar-planter with whom we have conversed; but we have heard doubts expressed of the entire efficacy of Messrs. Beale and Porter's plan, lest the boiling, by its means, should not be sufficiently rapid. We cannot conceive these doubts to be well founded. By reference to our diagram, which may be supposed to represent a sugar teach, it will be seen, that the heat applies with one uniform degree of intensity over its whole surface, and that, consequently, a

very *general* ebullition, and a very considerable evaporation must be maintained, even while the boiling does not put on the same appearance of rapidity as in vessels exposed to the naked fire, where a very violent effect is apparent in one part, while other parts of the vessel are comparatively cold; and we are fully warranted in entertaining this idea, by the experiment previously stated, where the evaporation per hour, from a patent pan, was greater, in a very material degree, than from one of equal size of the ordinary construction. But should this objection even be well founded, it will amount to very little, and can be easily and completely obviated, by the employment of two striking teaches, or of one with a more extended surface for evaporation, the increased cost being as nothing, when compared with the advantages of obtaining a larger and better produce.

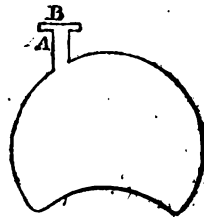
Want of space obliges us, for the present, to leave this most important and interesting subject. We shall take a very early opportunity of recurring to it, when we shall communicate to our readers some still more advantageous points of usefulness connected with the invention.

A SIMPLE, CHEAP, & SAFE SAFETY VALVE.

TO THE EDITOR.

SIR,—As you have been recently discussing the merits of various safety valves for steam boilers, I will give you a description of a contrivance which I have successfully applied to an engine of mine, in addition to the usual safety valves, and also to the copper boiler of a trial steam carriage, slightly noticed by you in the Register for (I think) November last. It is evidently the most effectual possible for preventing injury to any person by explosion.

Let a pipe A, of 2, 3, or 4 inches diameter, or of a size sufficient to discharge the boiler of steam gradually, be placed on the boiler in a *perpendicular* direction; on the upper flanch of this pipe fasten a plate of SHEET LEAD, B, of sufficient strength to bear some pounds per inch greater pressure than what is needful to work the engine. This strength may be previously ascertained by a forcing pump or other powerful lever. Suppose the steam required be 40 lbs. per inch, let the lead be able to bear about 60 lbs. per inch and no more. It is plain that, if the strength of steam be increased to 65 lbs. per inch, the sheet lead will tear asunder, and give vent to the steam, so that the boiler cannot possibly burst. The sheet lead assumes a spherical form long before it tears, and consequently, gives ample notice; and further, it may at any time be pressed down flat again when the steam is weakened. The pipe for the steam carriage (which has been proved to ascend a rise of more than six inches per yard, and waits only for patronage) is about one inch diameter, and the lead about the thickness of brown paper.



Your's, SAXULA.

IMPROVED BAROMETER,

By Mr. R. CHRISTIE, Secretary to the London Mechanics' Institution.

PREVIOUSLY to submitting a plan for effecting an improvement in the barometer, it will be necessary to point out the defects which are intended to be remedied. There are two kinds of instruments—the common barometer and the wheel barometer—in very general use, for determining the pressure of the atmosphere from the altitude of a column of mercury. Each of these kinds is intended to indicate variations in the altitude of the column of mercury of an hundredth part of an inch, occasioned by the varying pressure, but as they are generally constructed it is seldom possible to ascertain changes so minute; for, in the common barometer, the vernier, which is used to subdivide the inches into hundredths must, before the altitude is read off, be set by hand till its upper edge coincides with the surface of the mercury in the tube. Now, as this vernier is necessarily placed at some distance from the mercury, it is impossible, even for the most careful observer, to place the one always in the same position with respect to the other, and thus the advantage of the fine divisions is rendered unavailing. In the wheel barometer the changes are indicated by a long index, furnished with a small pulley on its axis, which is put in motion by the ascent and descent of two unequal weights, suspended by a string passing over the pulley. The heavier of the two weights rests on the surface of the mercury in the lower end of the tube which is turned up to receive it. Now as the pulley over which the cord passes is very small, compared with the circle round which the extremity of the index traverses, an action on the pulley of the hundredth part of an inch becomes apparent at the extremity of the index. This kind of barometer is objectionable on two accounts; in the first place, from its complexity, it is liable to derangement; and in the second, from the friction of the pivots on which the pulley and index turn, from the rigidity of the cord which passes over the pulley, and from the inertia of the weights, the force of the atmospheric changes will have to accumulate before the index can be put in motion; and, consequently, it will move by starts, passing over much more than the hundredth part of an inch at a time.

The improvement consists in attaching to a float which rests on the surface of the mercury in the lower end of the tube turned up, as in the wheel barometer, a slight vernier which indicates, on a scale of inches along which it moves, changes to the hundredth part of an inch. The vernier is attached to the float by a small steel wire which passes through a hole in a projection on the scale above the range of the vernier, and thus it is kept close to the scale without being permitted to touch it. As the moveable part of this barometer is very simple, it is not subject to derangement; as it is self-acting, it is not liable to error from setting the index to the altitude: as it is guided by a small wire passing loosely through a hole without pressing on either side, no inaccuracy will arise from friction; and as it is exceedingly light none will arise from inertia.

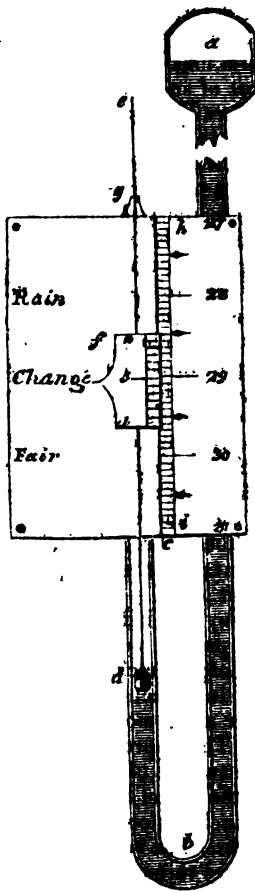
In dividing the scales in this as in other barometers, when accu-

racy is required, an allowance must be made for the descent of the mercury in the wide part of the tube, while it ascends in the narrow, and the contrary, depending upon their relative diameters.

To such of our readers as are not already acquainted with the construction of different kinds of barometers, the accompanying engraved illustration will be useful.

Where *a b c* represents a glass barometer tube about thirty-five inches long exclusive of the part *b c*; not less than a quarter of an inch diameter inside, and enlarged at the top *a* to about two inches. On the surface of the mercury shown by the shading, rests a small glass ball or float *d*, supporting a small steel wire *d e*, with its attached vernier *f*. This wire passes loosely through a guide-hole in the projection *g*, to keep it close to the scale of inches *h i*. As the scale and vernier do not, in other respects, differ from those of the common barometer, farther description of them here becomes unnecessary; but it may be worthy of remark, that the expense of manufacturing will not be augmented by the introduction of the improvement.

The upper part of the enlarged tube *a* being vacuum, the mercury is prevented from descending by the pressure of the atmosphere on the surface at *d*, and as the pressure increases it will force down the mercury in the part *c b* of the tube, permitting the float with the vernier to descend in the direction from 27 towards 31 on the scale; and, on the contrary, when the atmospheric pressure decreases, the mercury will be permitted to descend in the part of *a b* of the tube while it ascends in the part *b c*, and forces up the float and the vernier in the direction from 31 towards 27. By this means the vernier is made to traverse up and down the scale, and the changes in its altitude may be read off to the hundredth part of an inch with the greatest facility.—*Monthly Record of Science*.



ON THE INAPPLICABILITY OF STEAM TO CANAL NAVIGATION.

A CONTRIBUTION.

THE applicability of steam to the purpose of inland navigation, has been a favourite speculation with many persons. The advantages

anticipated are, increased speed in the transport of merchandize, and a reduction of freight from the superseding the use of horses. These anticipations appear natural, when we consider the celerity and certainty which our communications by water have attained, by the adoption of steam to the purposes of navigation, in the usual sense of the word; and also when we advert to the fact, that steam is rapidly and advantageously coming into general use as a prime mover in every branch of our manufactures, to the superseding of almost every other description of mechanical force. But, although reasoning by analogy the conclusion seems to follow, that its introduction in canal navigation must be attended by similar results, yet we apprehend that if the peculiarities of the case are attentively considered, the advantages and even practicability of the plan will appear doubtful.

Before the introduction of steam navigation the communication by water between distant places was by sailing vessels, whose arrival depended upon the state of the winds and tides, and which were therefore necessarily subjected to much delay and uncertainty; but the adoption of steam packets having in a great measure overcome these difficulties, travelling by water has now become almost as certain, and in some cases more expeditious, than by land; and experience having shown that the expense of maintaining large vessels is much less in proportion than that of small ones, vessels of great burthen are now employed as steam packets, affording such superior accommodation to passengers, as (when combined with considerations of economy and dispatch) to render this mode of travelling decidedly popular, and has contributed to its rapid spread to all ports in the kingdom.

But steam navigation is yet principally confined to the conveyance of passengers, to whom it affords greater certainty than sailing vessels, and at a much less expense than travelling by land; but canal boats are not subject to the same causes of delay and uncertainty which form the objection to sailing vessels; their arrival may be calculated on: hence, one important inducement which existed for the adoption of steam in the case of packets, is wanting in the case of canal boats. With respect to velocity it is seldom that the speedy transport of goods is of such consequence as the low price of freight, unless in the case of articles of a perishable nature, or the markets for which are exposed to very sudden fluctuations: but raw materials, as coals, slate, stone, &c., or whose manufactures are of a coarse and ponderous nature, as iron, earthenware, glass, &c.; in none of these instances would the increase of speed in the delivery compensate an increased charge for freight; and as it is clear, that if to obtain this increased speed additional horses are employed, the charge must be higher, we must endeavour to ascertain the probable economy of substituting steam for horse power.

The resistance to a vessel's motion through the water increases at the square of the velocity, i. e. if a power 1 would move a vessel at the rate of 2 miles per hour, it would require a power of 16 to move it at the rate of 8 miles; this resistance in the case of boats moving in narrow canals will be materially increased by the accumulation of water at the bow to a much higher level than at the stern,

causing a considerable hydrostatic pressure; a loss of effect must also result from the water receding from the impelling machinery, whatever be its description, so that, if instead of a boat's being drawn by 1 horse at the rate of 2 miles per hour, it were impelled by steam at the rate of 8 miles per hour, as some persons sanguinely anticipate may be the case, it would require an engine of at least 20-horse power.

The difference of expense between horse power and steam will of course depend greatly upon the situation of the place where the comparison is made, the average estimate is, that steam costs about one-third of what horses cost; but this estimate is made from engines employed on land, where the fuel is consumed under much more favourable circumstances than could be obtained in a canal boat. The usual estimate for a land engine above 10-horse power is 10 lbs. per hour per horse power, but Mr. Tredgold, in his *Treatise on the Steam Engine*, says, that in no case can the fuel consumed in steam-boat engines be estimated at less than 16 lbs. per horse power per hour; so that we may fairly say a 20-horse engine would consume as much as a 30-horse engine on land. The expense would therefore be equal to at least 10 horses. But the engine could not occupy less than at least one-third of the space of the boat, which would therefore carry only two-thirds the quantity of cargo, and this circumstance of itself must increase the freight one half; and, as at least the same number of hands must be employed as at present, no saving could be made in this item of expense, we therefore think that it is vain to hope for any great increase of speed in canal navigation, without a more than corresponding increase of expense.

But even supposing the preceding calculations as to expense are upon erroneous assumptions, still there is an objection to any great increase of speed on most of the English canals beyond the present rate, which we fear will be found insuperable; viz. the damage which the swell would occasion to the banks; we do not allude to the swell caused by the action of the paddles, for that could be effectually obviated by the adoption of some of the inventions at present before the public, (one of which, viz. Mr. Stevens's, of Plymouth, we conceive would be admirably adapted to the purpose); but we allude to the swell which would be caused by the rapid motion of a boat through a canal of narrow section, whether drawn by horses, or impelled by wind or steam. The impelling machinery, also, could not be placed at the sides, as the locks are merely wide enough to admit the boats as at present constructed; and if placed astern, there is reason to apprehend a loss of effect.

All these considerations lead us to doubt, as before stated, both the advantages and even practicability of the application of steam to canal navigation; and we think that the best prospect of transporting merchandize at any greatly augmented rate of speed will be by the application of locomotive engines on rail-ways. Our reason for this opinion is, that the loss of effect which is experienced when a horse exceeds the rate of $2\frac{1}{2}$ miles per hour would be avoided; and also, that the resistance on a rail-road being simply as the velocity, instead

of as the square of the velocity, (as on canals), if the power 1 would produce the speed 2, the power 4 would produce the speed 8; but not having space to say more on this subject, we refer our readers for experiments and calculations, to Wood's Treatise on Rail Roads, where they will find the result of experiments on a large scale given at length, showing what may be expected in actual practice.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from p. 240.

HAVING in our last number described Mr. Losh's patent method (just expired), of consuming smoke under an oblong steam engine boiler, we proceed to describe his plan of constructing a furnace under sugar pans, stills, and other vessels for simple evaporation, (included under the same patent), and the manner in which such furnace is worked to burn the smoke.

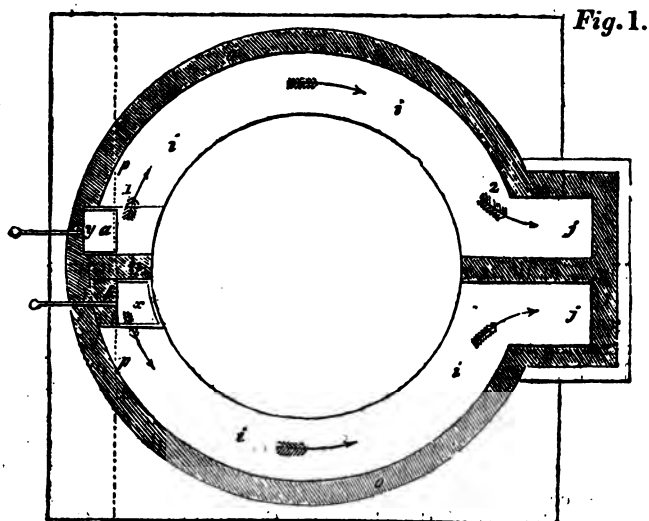


Fig. 1 is a plan or horizontal section of the pan and brick-work, at the level of the bottom of the flues; *ab* shew the openings from the grate rooms into the flues *iiii*, which convey the hot air, smoke, &c. to the base of the chimney *jj*, on each side of the division wall *n*, which also separates the two furnaces, and extends from the ash-pit diametrically across the pan, the bottom surface of which lies upon it, with a bearing of $4\frac{1}{4}$ inches wide. This wall rises 3 feet up the chimney, to keep the smoke, &c. of the two furnaces separated, till they have taken their perpendicular direction, and can no longer interrupt each other; *oo* is a circular wall, which surrounds the flue.

Fig. 2.

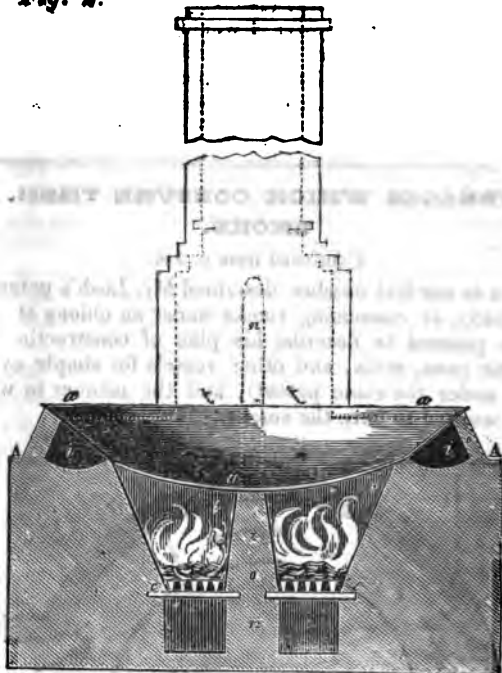


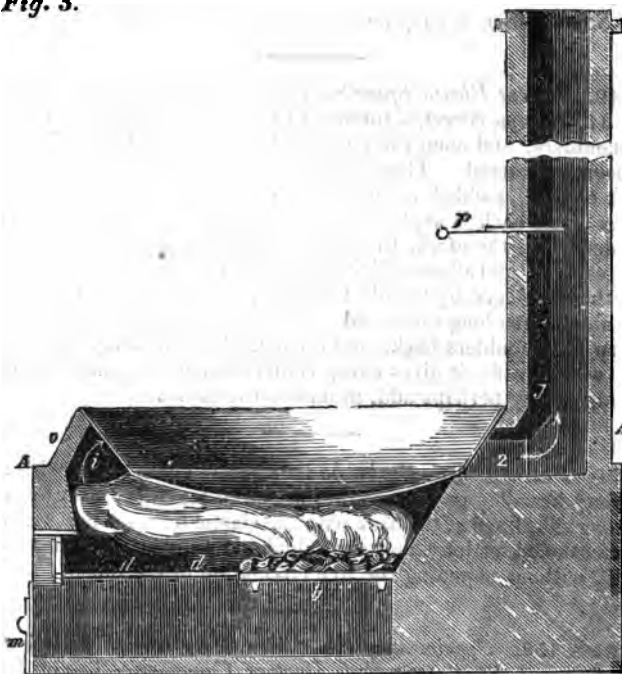
Fig. 2 exhibits a vertical section of the pan and furnaces; *a a a* shew the pan; *c*, the grates and bearing bars; *i i*, the side flues; *l l*, the grate room; *o*, the circular wall; *n n*, the division wall, shewn as extending to the back of the pan, and up the chimney.

Fig. 3 represents a vertical section of the pan, and one of the two furnaces under it; *b* are the grate bars; *d d*, the flooring-plates; *i i*, the entrance into the side flues; *j*, termination of the side flue in the chimney; *m*, a sliding damper, to regulate the admission of air into the ash-pit, according to the quantity required to keep up a due combustion of the fuel in the furnaces; *o* is the wall of the flue; *p*, a damper in the chimney; the arrows shew the direction of the hot air in the flues.

If it be required to burn the smoke, let there be dampers at *x* and *y*, (fig. 1), and a perforation of the wall at *z*, (fig. 2 and 3,) suppose both the fires at *a* and *b* (fig. 1,) to be burned clear, and that *b* requires a fresh supply of coals, shut the damper *x* and open *y*, then the smoke which sublimates from *b* will be forced over *a* and be burned in its passage. By reversing the action of the damper, the smoke from *a* may be consumed by the furnace *b*.

In adding fresh fuel, it is desirable to throw in but small quantities at a time, to keep the bars well covered, but in a thin stratum, and to allow the fire of the furnace last supplied to burn bright

Fig. 3.



before fresh fuel is added to the other; so that when one fire is at its highest degree of heat, the other is at its lowest, in order that the boiler may be kept continually at nearly an equal temperature.

The specification embraces a description of a furnace to a locomotive engine, in which the heated gases alone are allowed to operate upon the boiler, without any admixture of cold atmospheric air; also the adaptation of the principle to alum pans, bleacher's and printer's boilers, baker's ovens, &c., all of which, the practical man, who has occasion for such apparatus, will do well to consult.

To be continued.

NATIONAL REPOSITORY.

(Continued from p. 246.)

147. *Improved Galvanic Apparatus, by J. C. Bowles, of Cannon Street.*—The improvement consists in the zinc plates being cast with a hole, and worm or screw in them, by means of which greater uniformity of adjustment is attained. A specimen of the mould in which they are cast accompanies the apparatus.

148. *Indicator of Repulsion, manufactured by H. Marriott, of Fleet Street.*—See description of, page 222, last vol.

149. *Patent Elastic Spine Supporter, manufactured by H. Shoolbred, 34, Jermyn Street.*—Intended to restore the proper position of the shoulders, and open the chest, when a vicious habit of stooping has been contracted. This is formed of a broad plate or back piece of silk or jean, padded and rendered elastic by the fine wire helical springs; this back is kept in its place by a belt and straps round the shoulders. If, therefore, the wearer stoops or inclines forward, the springs dilate, and allow of that motion, but the pressure thus thrown upon the shoulders by the elasticity of the spring-back becomes inconvenient when long continued, and the wearer is gently constrained to keep the shoulders back, and accommodate the body to that attitude, which, while it gives ease, confers a more elegant carriage to it, and we may perhaps add, promotes the health.

150. *Patent Elastic Socks, by the same.*—These might with more propriety be called gaiters, as they are laced together; they are made of strong silk, lined at the back with the elastic wire springs, (as in the last-mentioned article) and are calculated to give support to weak ancles, without impeding the free circulation of the blood.

151 & 152. *Specimens of the Albion State Lamp, manufactured by T. Quarrell, St. Peter's Hill, Doctors' Commons.*—The oil is supplied from a reservoir above the light, and consequently the lamp is shadowless.

153 & 155. *Fusible Cement, manufactured by H. Fitz Lowitz, 54, Shad Thames, Southwark.*—This appears to be a very useful and powerful cement. It is stated to be of a mineral description, which is probably intended as a non-conductor to the secret. An example of its adhesive properties is exhibited in the Gallery, by the union of a variety of substances of dissimilar natures, which altogether form a water-tight cistern. Some experiments have been made by Captain Smith, of the Royal Engineers, under the direction of the Board of Ordnance, the result of which afforded satisfactory evidence of its superior adhesiveness to other cements.

1st, A case of wood was united with the cement *only*, lined with it, and in *less than half an hour* filled with water; it was perfectly tight.

2ndly, To show its adhesive qualities, two plates of iron 4 inches square with a hook in each, were united with the cement by a seam or joint of one eighth of an inch; on being suspended, it bore a weight of upwards of 800 lbs. before they separated.

3rdly, The flat side of a brick was united to an *upright board* by this cement, another to that, and so on, until the twentieth brick was

attached, when one of the bricks split, but none of the joints gave way. This experiment was repeated frequently, but in every instance the cement proved stronger than the bricks.

4thly, A piece of iron, with a hook at the upper end and shank three inches long, was inserted in a hole in a block of granite, and there fixed with this cement instead of lead; the block of granite was attached by the cement to another of the same size, weighing together about 300 lbs.; the two were suspended by the hook, and weights to the extent of 300 lbs. were placed on the upper stone, but nothing gave way: the iron was not dovetailed at the bottom, and this weight of upwards of 600 lbs. was supported entirely by the adhesion of the cement to the iron plug and the granite.

Some further experiments were made at the Tower in December last, under the direction of Mr. Wright, the clerk of the works; when one bushel of dry sand was found to weigh 130 lbs., and one bushel of mineral cement in a solid body 114 lbs. These experiments were made with a composition of 228 lbs. of sand and 114 lbs. of cement mixed together by melting; and,

1st, Two bricks were united by a joint of one-fourth of an inch with this guaged cement, and suspended by a chain which bore a weight of 1344 lbs., when one of the bricks split, but the joint with about one-fourth of an inch of the brick attached to it remained perfect.

2ndly, Bricks were united with this guaged cement in the same manner as described in experiment No. 3, at the King's Mews, and extended to eighteen joints, when the second brick broke.

The cement being thus properly guaged will unite bricks so firmly, that when coated with a mixture of three-fourths sand and one-fourth cement, they will form a solid body superior in strength and quality to sand stone, and applicable to similar purposes.

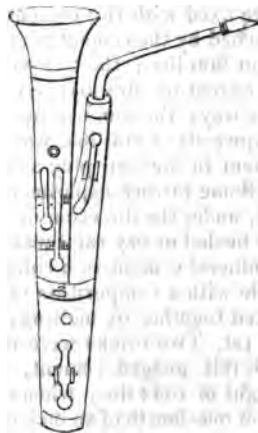
With this cement wood may be united to wood, iron, stone, bricks, tiles, or slate, and any of these bodies to each other indiscriminately.

It is proposed to apply this cement in the formation and lining of tanks or cisterns, the lining of damp rooms or cellars, coating the outside of houses, for gutters, for building turrets or minarets, light-houses, and wherever the firmest union of parts is required, fastening iron railings in stone copings, preserving wood in damp foundations, by coating it with cement, in jointing stone copings; and uniting iron pipes either for water or gas, more effectually than by lead or any other substance.

It is also applicable in its pure state for coating the bottoms of canal boats instead of copper.

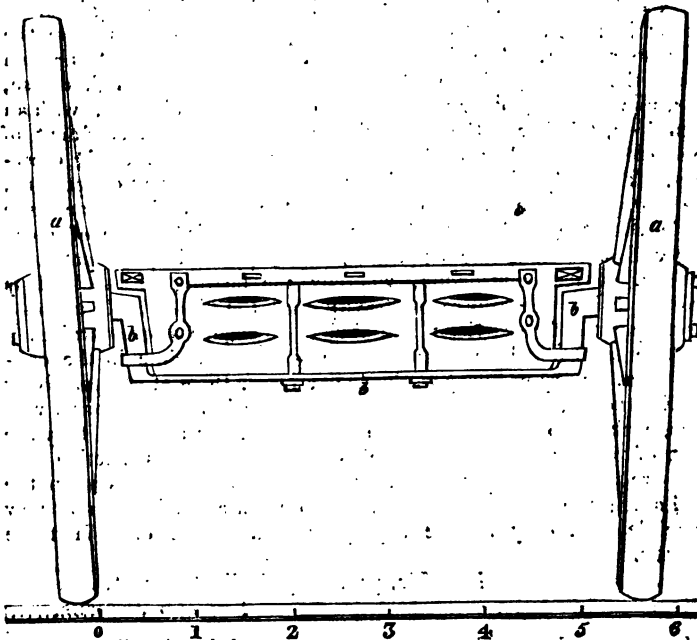
156. *Musical Glasses without water*, by J. Tait, Mary Street, Fitzroy Square.—Some improvements have been introducing into this charming musical apparatus, which renders it convenient to play when in a sitting posture.—See our last vol. page 223.

157. *Specimen of an Alto Fagotto, invented by Wm. Maible, and manufactured with improvements, by G. Wood, New Compton Street, Soho.*—The "Alto Fagotto" implies octave fagotto, indicating its application in an orchestra. The tone of the instrument is very sonorous, the upper notes approximating closely to those of a horn, though much softer; the lower notes resemble those of a bassoon, blending very harmoniously with the voice, piano-forte, &c. The compass of the instrument is three octaves, commencing with the *c*, in the second space bass clef, or four notes lower than the fourth string of the violin, continuing to the *c*, the second ledger line above the treble staff, with their intermediate semitones. It is played with a reed and mouth-piece, similar to a clarionette. The figure represented in the margin, although in appearance like the small bassoon, differs materially in its tone and compass. There are three keys and key-holes on the opposite side to that delineated.



MISCELLANEOUS INTELLIGENCE.

EXTRAORDINARY PRINTING.—The Atlas Newspaper, published on the 14th of March, had 20,000 copies struck off in the space of a few hours; each copy containing 40 feet of printed superficies; therefore, 800,000 square feet of printed surface were produced, capable of covering an area of about 20 acres. This number of copies consisted of 820,000 leaves, measuring sixteen inches in length, or of 640,000 pages, or of 1,920,000 columns, or of 241,920,000 lines, or 2,419,200,000 words. Assuming, therefore, that an ordinary octavo volume of 500 pages, each of 34 lines, and of 10 words in each line, contains 170,000 words, the press of the Atlas may be said to have printed in the course of a few hours, sufficient matter for 14,280 octavo volumes. If the 16 leaves of each copy be cut out and placed end to end, they would reach from London to Salisbury; and if each leaf be divided into its respective three columns, and similarly arranged, the printed slip then formed would be of sufficient length to go round Middlesex and the seven surrounding counties. The whole of the machinery by which these wonderful effects were produced, consists of two larger and two lesser cylinders, put in motion by a steam-engine of Maudslay's of four-horse power, managed by three boys, whose interference on the occasion was strictly limited to the presenting the end of the enormous blank sheet to the first cylinder, and to the receiving it in a few seconds, printed on both sides, as it was discharged by the last cylinder.

**PATENT CARRIAGES.**

By EDWARD JOSEPHS, Esq. of No. 3, Haydon Square, and 28, Great Prescott Street, Goodman's Fields.

TO THE EDITOR.

SIR,—Amongst the numerous experiments and inventions, it is surprising that in this great commercial and manufacturing country, where inland transport is principally conducted by land carriage, no material improvement in the construction of waggons and other conveyances of burden, should hitherto have presented itself to the enterprising mechanic.

Whatever alterations or embellishments have recently been practised as improvements upon vehicles of pleasure, little or no study has been applied to bring conveyances of burden to any higher state of perfection than that we still observe waggons, trucks, and vans, with loads of less than four tons weight, drawn by three and four horses. That there was great room for improving the draft of these ponderous machines, must appear evident; and this prominent source of commercial enterprise induced me to apply myself to the construction of a carriage, whereby considerable horse labour may be saved. After great expense and labour I have had the satisfaction to complete a vehicle, which possesses most important advantages. Several trials

have already been made with loads (including the waggon 1½ tons) of six and seven tons, and it may be estimated that the saving in horse labour is from two fifths to one half required by waggons upon the old construction. As a further proof, I need only say, that one man wheels the vehicle (weighing 35 cwt.) out of the yard like a light chaise, I am now building other waggons to carry coals and flour, with an even floor, (similar to the coloured drawing,*) and feel confident of complete success, they will be much lighter than the annexed† drawings. The body of these carriages may be built to any dimensions, the fore wheels are made to lock under the bed, and turn an acute angle with the greatest facility; the hind wheels may be of much larger diameter than the usual size, and supported by a bent axle upon a particular principle, whereby the bearing of the load is brought below the centre of gravity, and the hind wheels act as a lever upon the fore carriage, and obviate all chance of overturning.

The mechanical combinations are extremely simple in the construction, as any ordinary workman can repair them at comparatively small expense, and as regards the durability of these waggons I will engage them to last longer than any other; for although they are built of lighter materials, there is considerable less friction and pressure, and I may say three fourths of the weight rests upon the hind axle; the boxes and arms are also upon a particular and new principle, and only require supplying with grease once in three months.

I am Sir, your very obedient servant,

EDWARD JOSEPHS.

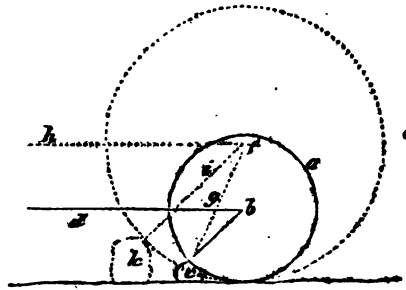
The annexed engravings "and the coloured drawing," mentioned by Mr. Josephs in the preceding communication, we have not considered to be necessary to have engraved, as neither the one, nor the other, exhibit any essential alteration or improvement in the construction of ordinary waggons, except as respects their being provided with much larger hind wheels; and, as the manner of applying such wheels to carriages having floors of the ordinary height is best elucidated by the end view of the carriage given in the preceding diagram; where,

a a represent the hind wheels, *b b b* the banded axle-tree of a crank form passing under the bed of the carriage, which lies between the two extremities of the axle-tree, and permits the floor of the carriage to lie close to the upper side of the axle-tree; the floor being usually as much above the latter as the thickness or depth of the bed. To make larger wheels than those in ordinary, by the usual arrangement of parts, the floor of the carriage would be raised too high, for the convenience of loading and unloading, which should be such as a man may easily take a sack of coals or flour upon his back.

The advantage of using large wheels to carriages will be apparent, when we consider, that the principal resistance to their motion consists

* Not published. † Ditto; for reasons, see our remarks, which follow the Edmonson's letter.

in the inequalities of the surface they roll over, which resistance amounts to perhaps, $\frac{1}{4}$ ths of the whole. The wheel being now regarded as a continued series of levers arranged in a circle, it follows, that to increase the diameter of the wheel, you increase the length of every lever, at the power end; the fulcrum and the resistance (or weight) being the same, while the power is applied with greater efficacy. It seems therefore evident, that if the radius of the wheels of a carriage be increased one fourth, the draught horse will in consequence be enabled to draw one fourth more of weight. A little further consideration of the subject will make it appear that the advantage is not confined to the simple increase of leverage, but that the draught is facilitated from another cause, which we will explain by a little diagram.



Let the circle *a* represent a small wheel, whose axle is at *b*, and *c* to be a stone lying in the road, over which the wheel is about to pass, and *d* the line of draft. Next, let the dotted circle *c* represent a larger wheel, whose axis is at *f*; the radius in this case being *f c*, instead of *b a*, there is not only an increased leverage, but a more favourable position to the lever *f a*, of the larger wheel to overcome the resistance at *c*. If it be argued (which, however, does not apply) that the cases are not similar, owing to the difference between the angles of inclination of the respective radii, let *k* represent a larger stone, at the same angle (45°) as the smaller, it will then be seen the large wheel will as easily roll over the great stone *k*, as the little wheel over the small stone *c*. These matters are too obvious to need further remark.

The patentee in his communication, alludes to other advantages obtained by his plan of building carriages, and while we confess our inability to discover them, we beg to state, that the Register is open for the publication of any demonstration that he may favour us with on the subject.

Some experiments have been made in the most public streets of the city, with waggons of this construction very heavily laden, which fully established their superior facility of draught over the ordinary vehicles, resulting, we conceive, wholly from the superior size of the wheels.

PATENT WHEEL CARRIAGES.

By J. L. HIGGINS, of Oxford Street.—*Dated January, 1828.*

THIS improvement upon wheel carriages consists in supporting the body upon three wheels, two before and one behind. The frame containing the hind wheel is so connected with the axis of the fore wheels, that the centre of motion in turning is situated very near to the wheel on that side to which the carriage is turning. This is effected by projecting from the axle at a little distance from the nave two pins, which serve the one as a centre, and the other as a guide, passing over the interior surface of a circular part of the frame, according as the carriage is turning to the right, or to the left, and hence requiring but a comparatively small space for turning.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from p. 253.

As the consumption of the smoke usually made in common domestic fire places, is obviously an object of as great importance to health and comfort, as the getting rid of that elicited from the furnaces of steam engines, &c.; (the smoke from the former, on account of their great numerical superiority, being vastly more in the aggregate, than the latter,) we proceed to notice an invention of great merit viz. the

PATENT SMOKE CONSUMING REGISTER STOVE,

By Mr. JOHN CUTLER, of Great Queen Street, Lincoln's Inn Fields.

This patent is dated January 6, 1815; consequently, the term of 14 years has expired, and the invention is open to the public for their adoption and use. At the time that it was first brought before the public, it met with considerable patronage, but we believe it is now almost out of use, owing to some difficulties of a very slight description, for which no sufficient remedy has yet been provided. The spirit of enterprize which originated the invention, received, we have been informed, a severe check, by the numerous and combined attempts of the (stove-makers) to pirate or invalidate the patent right; the defence set up by the trade, for this conduct, was, that the patentee had refused to grant licences to them to make the stoves, by their paying him a compensation. At this time the stove was in high repute, and the patentee injudiciously refusing the trade all participation in the business, they commenced operations without his leave; the patentee then finding that he could not stem the torrent of invasion, offered to grant licences; but the offer came too late, the pirates refused to accept them. To avoid detection, the stoves were varied as much as possible from the original, and to this circumstance, it is probable, may be attributed their afterwards falling into

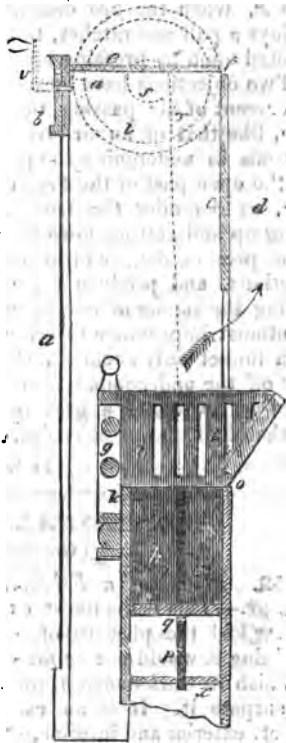
discredit : opposition to the inventor, and injudicious construction, no doubt, contributing to this end.

The principle of the invention is good, and will, probably, under able management, be made a most efficient and valuable apparatus.

It does not accord with our limits to give the whole specification, which embraces many figures; the diagram which we annex will sufficiently explain every thing that is necessary to the mechanic, or interesting to the general reader.

The invention consists in the construction of stoves and fire places in such a manner, as that the fuel necessary for combustion shall be raised and supplied from a close chamber beneath, where the upper stratum of coal shall be constantly undergoing the process of coking, the gas from which becomes ignited in passing through the open part of the grate above; and by causing the said chamber to descend at pleasure, so as to extinguish the fire.

The figure represents a vertical section of a register stove, presenting an end or side view; *a* is one of the front pilasters; *b* the entablature; *c* the back; *d* the chimney, the entrance to which is shewn by the curved arrow; *e* the top plate, turning upon hinge joints to be raised up whenever required for sweeping; this top does not fill up the space accurately, but leaves a narrow opening at *f*, for the escape of the vapours and dust that may arise prior to the current being established in the direction of the arrow, by the effects of the combustion; *g* are the front grate bars; *h* the receptacle for the coals, including the place (as usually) where they are burned, as the air which finds its way into the close box *h* is only sufficient to coke the coals, their perfect combustion is not effected until they are raised above the front plate *k* at which place the air pours in on all four sides; between the bars in front, through the side grates, one of which is shewn at *l*, and from an aperture at *o*, under the bottom edge of the back; *p* is a vertical groove, in which the bar *q* (seen endways) traverses up and down, supporting the moveable bottom plate of the coal box *h*. To each end of this bar, exteriorly, is attached a chain *r*, which thereby suspend the coal chamber, (or moveable bottom) by an horizontal roller *s* extending across the stove. This roller is the shaft or axis of a cog wheel *t*,



and is put in motion by a pinion *v*; the axis of *v* is a small square pin, fitting into the cavity of the winch *u*; the turning round of the latter winds the chain upon the roller and elevates the moveable bottom *q*, which raises the coals as they may be required for combustion to supply the place of those which have been consumed. On turning the winch the contrary way, the bottom of the coal receptacle descends by its own gravity, and that of the coals resting on it, as far as the plate *x*, when the fire dies away, for want of air. The patentee employs a pall and ratchet, to stop the action of the roller, which is operated upon by pressing upon a pin, placed externally.

Two objections have been urged against these stoves; one, that the current of air passing through it makes an unpleasant roaring noise, like that of an air furnace; the other, that the expansion of the coals in undergoing the process of coking prior to being raised into the open part of the fire, causes them to adhere so fast to the sides, as to render the friction excessive, and the labour great of raising up and getting down the coals. We hope that the mechanics of the present day, will discover some means of obviating these objections, and produce some simple and effectual apparatus for burning the smoke of our common fires. Such a result would be of the utmost importance in economising fuel; for an aperture opening into a funnel only about 3 inches in diameter, would be sufficient to carry off the undecomposed or incombustible vapours, and a room would be heated to a greater degree and more uniformly by a fire less than half the present size.

To be continued.

NATIONAL REPOSITORY.

(Continued from p. 236.)

159. *Model of a Frigate, with all her rigging and furniture complete.*—This is the finest example of the modelling of a ship that we ever had the pleasure of beholding. An hour or two spent in examining it would not be mis-spent. For accuracy of proportion, and finish in workmanship, even in the most minute details, nothing can surpass it. It is an exact miniature representation in every respect, exterior and interior, of one of the finest ships in the British Navy. Every piece of wood or metal is shaped and proportioned after the original; from the cables to the smallest lines the same proportions are observed, with the exact number of strands, &c. By looking through the cabin windows, down the hatchways, and through the port holes, every part of the vessel may be inspected, and the more you examine the more will the interest increase. It must at ordinary wages have cost several hundred pounds in the construction, though the model is only about two feet long.

238. *Terrestrial Globe, by Addison.*—This globe is of the largest size ever constructed in this country, and conveys the most recent geographical discoveries.

239 & 240. *Specimens of Globes*, by J. & W. Newton.—In these Globes the ecliptic line may be dispensed with, by means of an improved analemma, showing the sun's declination, and place in the zodiac.

241. *Calculation Frame*.—This apparatus consists of a rectangular frame, (like that round a slate) having a series of parallel wires extended across it in one direction, in each of which slide ten or twelve little wooden balls, by the wires passing diametrically through them. It is in common use in the infant schools, and is well deserving of universal adoption: a child that has learned addition (in arithmetic) will by it readily understand subtraction, and instead of repeating (without understanding why) that 4 times 4 is 16, &c. in the multiplication table he will see that it is so, and be able to solve in the most amusing and agreeable manner, every difficulty that presents itself, in this otherwise, very perplexing, and painful study, to the youthful minds.

245. *Improved Air Pump*, by F. Elliot, Jun.—See our last volume, page 216.

246. *Model of a Locomotive Steam Engine*.—The original of this model has been working at the Rothwell Haigh Collieries for several years. It is stated to be of 7 horse power, and to draw 70 tons at the rate of $3\frac{1}{2}$ miles per hour.

247. *Model of a Steam Engine*, by Oaks and Son.

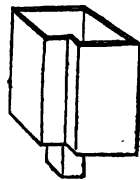
249. *Specimen of a Silk Weaver's Reed*, of the finest sort.

250. *Improved Safety Lamp*, in a thick globular glass.

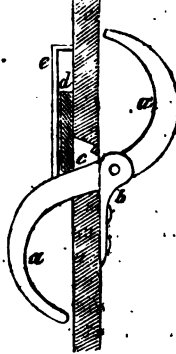
251. *Marine Safety Jacket*, by Lloyd, lined and padded with cork dust.

252 & 253. *Scaffolding and orchard ladders*, by Gregory.

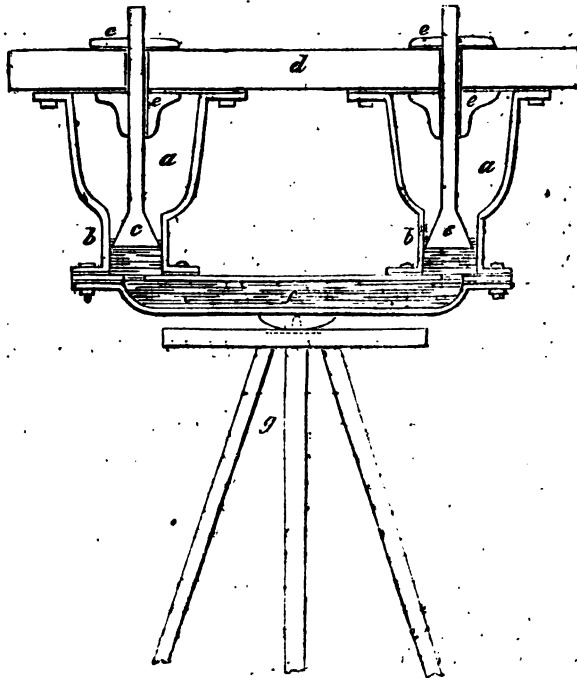
254. *Specimen of a cast iron Socket and dowel for Door Jambs*, by T. N. Parker, Esq. of Sweeny.—These sockets are especially designed for the lower ends of the jambs of door frames that are much exposed to wet, and they are evidently calculated to increase the durability and strength of these parts, and to form a very useful addition in house building. The article in the Repository, is an example of remarkably fine casting. They were cast by the Colebrook Dale Company, weigh only 7lbs. per pair, and are retailed at Oswestry, at $2\frac{1}{2}$ d per lb.



355. *Improved Door Latch, by the same.*—This latch has the advantage of opening simply by a pull on either side of the door, as will be understood on inspection of the figure in the margin: *a a* is a curved piece of metal like the letter *S*, which turns upon a joint at *b*; it passes through the door at *c*, with the latch *d*, (inclosed in the keeper *e*) resting upon it. On one side of the door the curved bar or hook acts as a lever of the first class to lift the latch, and on the other side, as a lever of the second. It is a very simple, cheap, and substantial contrivance, and a decided improvement upon the "thumb latches," in ordinary use.

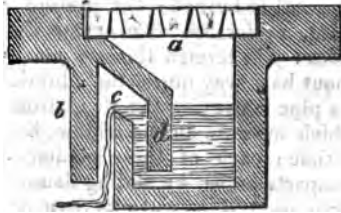


Quicksilver Level for Irrigation, Draining, &c. by the same.—This is a very simple and cheap instrument for the purpose, it will bear very rough usage without injury, and costs only about as many shillings as the usual instrument costs of pounds. The essential parts



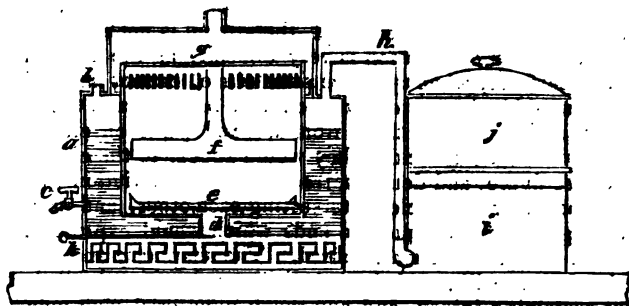
of the instrument consists of two iron funnels *a a* cast from the same mould, with cylinders *b b* of exactly equal diameters, bored out of the solid metal: *c c* are two floats, also exactly equal to each other in length, weight, and lower surface. A hole one eighth of an inch in diameter is drilled on one side of the funnels for introducing the quicksilver, and afterwards closely stopped with a fine cork: *d* is a mahogany top to the instrument, to which the funnels, &c. are screwed; *e e* are collars or guides for the floats, made of lignum-vitæ, and to prevent the escape of the quicksilver; *g* is the stand and pivot on which it turns; *p* are plates of cast iron, the upper one plain, and the lower one grooved, between which the quicksilver flows, as shown at *q q q*. Between all the junctures of this apparatus wash leather is to be introduced, to keep them tight. In using the instrument, an observation is made on the tops of the floats, which when they exactly coincide, shows the ground to be a true horizontal plane; on the contrary, when they differ in height, the ground is not a level. This mode of taking an observation is very difficult, as the most distant of the two surfaces, when upon the same plane, cannot be distinctly seen. It would be better to have a circular hole through the tops of the floats, and to look at them from a fixed point on either side; when the two circles coincided they would appear to the eye as only one of a true figure, and denote a true level; any deviation would be clearly denoted by the circles intersecting each other, and producing a curved figure with two pointed ends which would express exactly the extent of the attraction required. The simplicity and strength of the instrument will permit its being thrown down, and rolled about without sustaining injury, and any rough unlettered clod-pole may use it with effect. It may be had, we believe, of Mr. Batt, Seedsman, 412, Strand.

Improved foul Air-trap, by the same.—This useful apparatus instead of being made of metal, is fabricated of the common red pottery, and is particularly adapted for falling into a course of the 'flooring quarries' used in many parts of the country, which are cleansed by washing and sluicing them with water. In its superficies it presents a square of 9 inches, the same as the ordinary quarries; *a* is the grating, *b* the trap frame; it will be evident that no foul air can pass up the grating, as the only passage for it is through the water, over the stop *c* and under *d*.



Calefactor, or Portable Cooking Apparatus, invented and manufactured by Tozer and Son, 20, Henrietta Street, Covent Garden.—This is a novel and very ingenious arrangement for economising the

heat, given out by a small quantity of fuel (charcoal) in a close chamber, for culinary purposes. It is a modification of the principle on which the periparist (described at page 213 last vol.) is constructed, and is contrived to meet the wants of a family, especially in the summer season, when the smallest quantity of artificial heat in the kitchen or other apartments, is devoutly desired, whether for comfort or economy. The pretensions to public patronage set forth in the printed prospectus, are large; they are nevertheless such, as with very little discount, he is warranted in stating. The subjoined diagram is explanatory of its construction, and arrangement, when applied to roasting and steaming: some of the parts in the drawing are slightly varied from their real position, for the purpose of elucidation by a single figure; *a* is the steam boiler, which has a large elliptical



opening down the centre, for depositing a variety of culinary vessels therein: *b* an aperture for charging the boiler with water: *c* a stop cock, for drawing off the water as may be required, but placed high in the boiler, to prevent the possibility of a person injudiciously drawing off the whole, and thereby expose the vessels to the unprotected heat of the fire: *d* an aperture through the bottom of the boiler, to admit a draught of air to the grating *e*, on which the charcoal is burned; the grating is, strictly speaking, a strong iron plate, perforated all over for the free admission of air through the holes: *f* is termed the *oven pan*, which is a cast iron dish suspended about half way down the elliptical opening; *g* a sheet iron cover; *h* a pipe conveying the steam from the boiler *a* to the steamers *i* and *j*, which separate in the middle, and allow of one or both being used at a time; each of these steamers may be subdivided into distinct compartments: *k* a sliding damper, for enlarging or contracting the air passage *d*, so as to increase or diminish the combustion of the fuel as may best suit the peculiar culinary process.

When the *apparatus* is not required for roasting, but for boiling or souping, or brothing, the oven pan is to be removed, and in its place the required vessels (all of which are made to fit) are deposited. In some cases the patentee adopts, too, half kettles in the place of one. A current of heated air is constantly kept up, entering at the grating

at bottom, and passing out at the grating above, where the heat is reverberated against the top and sides of the cover prior to its escape through a small central aperture in the latter.

To be continued.

OBSERVATIONS ON THE INCRUSTATIONS AND OTHER DEPOSITS IN STEAM BOILERS.

TO THE EDITOR.

SIR,—Having read your account of Mr. Scott's patent method of preventing the incrustations, and deposits in the sides and bottoms of boilers, (vide vol. 2, page 372, N. S.) which are only applicable to those having large chambers; I have been led to consider, if it be practicable to prevent the deposition in other boilers, wherein such apparatus cannot be used; and the only method by which this can be effected, is to purify the water from the matters which cause the incrustation.

I propose, that the water intended for the use of the boiler be first analyzed, to ascertain what are the salts or earths which it holds in solution, or in suspension. Perfectly pure water is seldom, if ever, obtained from nature. Even rain or snow waters, contain whatever floats in the air, or has been exhaled with the watery vapours: from the small quantity of foreign matter contained in these waters, they are, however, particularly desirable for the use of steam boilers, as no inconvenience could result from their impurities, for a considerable period of time. But all waters that flow within or upon the surface of the earth, are more or less impregnated with earthy, saline, metallic, vegetable, or animal particles, according to the substances over or through which they pass.

The following are the characteristics of pure water; it is lighter and more fluid than impure water. It has no colour, taste, or smell. It wets easily, and is soft to the touch. Soap mixes easily and perfectly with it. It is not rendered turbid by a solution of acetate of lead in water.

Turbid water may be rendered bright by rest or filtration, because the particles of matter which render it so, are simply suspended in the liquid; but such water, after being rendered by filtration colourless and transparent as crystal, may yet be very impure. The necessary limits of this latter will not permit me to describe the various modes of examining water, with the view of ascertaining what it contains, but I will shortly observe, that there are three distinct modes. First, by the senses; second, by re-agents; third, by analysis.

In examining the nature of water by *the senses*, (i. e. by the appearance, smell, and taste) very inaccurate conclusions may be drawn; in the taste, for instance, one salt may disguise the presence of another. By the employment of *re-agents*, the various matters contained in the waters are discoverable, and by *analysis* their individual quantities. By the first of these modes, the indications are, sometimes, such as to suggest to the chemical examiner the proper remedy; by the second of these modes, they are generally so; and by the third, always.

The labour of analysis may be considerably shortened, by observing that the following salts are incompatible with each other, and cannot exist together in water, except in very minute proportion.

<i>Salts,</i>	<i>Incompatible with</i>
Fixed Alkaline Sulphates.	{ Nitrates of lime and magnesia. Muriates of lime and magnesia.
Sulphate of lime.	{ Alkalis. Carbonate of magnesia. Muriate of barytes.
Alum.	{ Alkalis. Muriate of barytes. Nitrate, muriate, carbonate of lime. Carbonate of magnesia.
Sulphate of magnesia.	{ Alkalis. Muriate of barytes. Nitrate and muriate of lime.
Sulphate of iron.	{ Alkalis. Muriate of barytes. Earthy carbonates.
Muriate of barytes.	{ Sulphates. Alkaline carbonates. Earthy carbonates.
Muriate of lime.	{ Sulphates, except those of lime. Alkaline carbonates. Earthy carbonates.
Muriate of magnesia.	{ Alkaline carbonates. Alkaline sulphates.
Nitrate of lime.	{ Alkaline carbonates. Carbonate of magnesia and alumina. Sulphates, except of lime.

The uninitiated in the processes of analysis, I would recommend to consult Dr. Ure's Chemical Dictionary, from whence the foregoing list of salts is extracted; and the annexed practical modes of obviating the injurious effects of depositions in boilers; I extracted from a scientific work (I forget the title) some time back, seem to be well deserving of attention, and ought, I think, to find a place in every work devoted to the improvement of the useful arts.

In collieries, where the steam engine is applied for drawing water from the mines, it frequently happens that, after a continuance of wet weather, the water accumulates so fast, as to require the engine to be worked night and day. In this case a great quantity of earthy matter is brought immediately from the surface, which renders the water within the boiler very muddy, and there being little time for cleaning the boiler, owing to the accumulated water in the mine, six or eight weeks sometimes elapse before this can be done. Towards the end of this period, the water in the boiler is mixed with sediment, to such a degree, that the ordinary supply of steam cannot be raised, although the fire is increased in the furnace. The consequence is, that the common working speed of the engine is greatly reduced; and, in this case, it has been the constant practice of the engine-keepers in

Scotland to apply a very simple remedy for increasing the quantity of steam.

The substance employed is known by the name of *comings*, being the radicles of barley, produced in the process of malting, which are separated before the malt is sent to market. About a bushel of these is thrown into the boiler, and when the steam is again raised, an immediate effect is visible; for there is not only a plentiful supply of steam to produce the full working speed of the engine, but an excess of it going waste at the safety valve: this singular effect will continue for several days.

In the distillation of ardent spirits upon a greater scale, it is found necessary, when converting the fermented liquor, or wash, into low wine, to throw a quantity of *soap* into the still every time it is charged or filled, which has the effect of causing the steam to rise more quickly, and more disengaged from the residuary matter. I do not, however, see any analogy between this process, and the effect produced in the engine boiler before mentioned.

The sediment, in boilers, produced after wet weather, is chiefly composed of clay, and does comparatively little injury to the boiler; but, in general the common mine water which percolates very slowly through the strata, produces a sediment of *sulphate of lime*, which adheres so closely to the bottom of the boiler, that it cannot be removed but by punching it off with a sharp iron instrument, and this sediment when removed, has frequently a thin scale of the iron plate of the boiler adhering to it. In this way the boiler is not only injured, but if the sediment accumulates at any part of the bottom, the plates are liable to become red hot at the place which greatly injures them.

To lessen these injurious effects, it is the practice to throw into the boiler a quantity of peat earth in its natural plastic state, which is found to have a considerable effect in preventing the sediment from adhering so closely to the boiler plates.

I remain, Sir, your constant reader,

A. M. A——r.

MISCELLANEOUS INTELLIGENCE.

ANTI-CONVULSION SYSTEM OF GEOLOGY.—In a notice of a work entitled 'Lettres sur les Révolutions du Globe', in the section of Natural Science of the 'Bulletin Universel', the Baron de Ferussac repeats an opinion maintained by him on former occasions in the same Bulletin, that the present state of the earth's surface in the geological point of view, is the last, or rather the most recent, of a series of successive and gradual modifications; that, in fact, there have not been any revolutions, properly so called, on the globe; but an uninterrupted succession of phenomena diminishing in importance with the course of time, as the energy of the causes on which they depended have become less; and the greater part of which still continue and are in a state of progression; but with less force, and on a more limited scale than heretofore. In a word, that the general laws of harmony

have not been disturbed on our globe more than in any other part of the Universe; and that the explanation of geological phenomena, instead of being discoverable in a desolating theory of imaginary convulsion, is to be found in the natural consequences of the primitive state of the globe, and the necessary effects the general laws to which matter is subjected. True it is, convulsions, violent ruptures of beds, their re-formation; the change of place of substances, the consequences of a certain anterior order of things, cannot be mistaken. But these effects are far from being the consequences of disturbances of the established order,—of deluges in fact. The Baron asserts that the whole history of the globe is contained in a few lines formerly published by him, in which he maintained that it was time for geologists to abandon the system of convulsions of nature and of cataclysms; to acknowledge the influence of natural causes, and of the order and permanence by which the universal planetary system is governed. The primitive volcanic fire and its consequences; the formation of waters by the condensation of gases; the sinking of their level in consequence of the infiltration effected in proportion to the refrigeration and to the thickening of the crust of the earth, and the diminution of the temperature on the surface of the globe—the effect of the same refrigeration, are the primary causes from which the explanation of the geological phenomena proceed, by a natural and easy concatenation.—*Journal of Facts.*

USE OF RICE.—Among the most useful and nutritious substitutes for wheat, and which has the advantage of correcting the unwholesome properties of bad flour, is rice. During the scarcity of wheat in July, 1795, one of the measures adopted at the Foundling Hospital, with a view of lessening the consumption of flour, was the substitution of rice puddings for those of flour; which, by the table of diet, were used for the children's dinner twice a-week. The flour puddings, for each day, had taken about 161 lb. weight of flour; the rice puddings, substituted in their place, required only 21 lb. of rice, to make the same quantity of pudding; the result of the experiment being that, in a baked pudding made with milk, one pound of rice will go very nearly as far as eight pounds of flour.

Rice contains a great deal of nutriment in a small compass, and does not pass so quickly off the stomach, as some other substitutes for wheat-flour do. It is a good ingredient in bread. Boil a quarter of a pound of rice till it is quite soft; then put it on the back part of a sieve to drain it: and when it is cold mix it with three-quarters of a pound of flour, a tea-cupful of yeast, a tea-cupful of milk, and a small table-spoonful of salt. Let it stand for three hours; then knead it up; and roll it in about a handful of flour, so as to make the outside dry enough to put into the oven. About an hour and a quarter will bake it; and it will produce one pound fourteen ounces of very good white bread. It should not be eaten till it is two days old.—*Camp. to B. Almanac.*

RAISING OF THE SOIL IN EGYPT.—Such has been the increased height of the surface of the valley of the Nile, that a depth of upwards

of eight feet of vegetable soil covers the summits of statues still in their original position.—*Leermant.*

THE SHIPWORM.—Of the marine tribe of Moluscs, the *Teredo navalis*, the shipworm, is the only one which has excited notice by its destructive powers. This shell-enclosed worm, which Linnaeus has styled the 'calamitas navium,' is said to be introduced into our seas from the East within a little more than a century. They are now common in all the seas of Europe; and being gifted with the power of perforating wood, they have done, and continue to do, extensive mischief to ships, piers, and all sub-marine wooden buildings. The soundest and hardest oak cannot resist them; but, in the course of four or five years, they will so drill it, as to render its removal necessary, as has happened in the dockyard of Plymouth. In the years of 1731 and 1732, the United Provinces were under a dreadful alarm, for it was discovered that these worms had made such depredations on the piles which support the banks of Zealand; as to threaten them with total destruction, and to claim from man what he had wrested from the ocean. Fortunately they, a few years after, totally abandoned that island, from causes unknown, but suspected to be from their not being able to live in that latitude when the winter was rather severer than usual. The method now adopted to preserve the timbers necessarily used about the docks at Plymouth is, to cover that part which is continually under water with short broad-headed nails, which, in salt water, soon cover every part with a strong coating of rust, impenetrable to these animals.—*Mag. Nat. Hist.*

COMPONENTS OF SWEET AND BITTER.—Dr. W. Herschel has discovered, that the mixing of nitrate of silver with hypo-sulphate of soda, both remarkably bitter substances, produces the sweetest substance known; a proof how much we are in the dark as to the manner in which things affect our organ of taste. So, bitter and sweet, as well as sour, appear not to be an essential quality in the matter itself, but to depend on the proportion of the mixtures which compose it.—*Journal of Facts.*

DANGER FROM RATTLE SNAKES.—According to Mr. Flint, the author of a work on the geography and history of the Western States, U. S., the danger of the rattle-snake is more imaginary than real: at any rate, it has been the subject of much exaggeration. He says he has seen great numbers of persons who have been bitten by rattle-snakes, or copper-heads, or morassins, but had never known a fatal case.—*Ibid.*

NEW RAIL ROAD IN FRANCE.—Measures are taking to form a rail road between Andrézieux and Roanne, at which town the Loire becomes navigable. The object of this rail road is to complete the system of roads and canals established in that part of France, and to perfect the communication between the north and south of the kingdom, from Marseilles and Lyons to Paris and Havre.—*Id.*

DEAD LEAVES A PROTECTION TO THE ROOTS OF VEGETABLES.—Heaps of fallen leaves are recommended to be placed around the roots of garden vegetables, to protect them from too great humidity, more hurtful to them than the cold, since they are more liable to decay with the damp than to freeze. Some leaves possess, in a greater degree than others, the power of throwing off the wet; the leaves of the oak are endowed with this quality in an extraordinary degree; tender leaves, on the contrary, such as those of the lime-tree, admit the wet more easily. A report made to the Horticultural Society of Berlin recommends also the leaves of the beech-tree and field-moss as a preservative to the roots of vegetables.—*Bull. Univ.*

INCREASE OF THE POPULATION OF EUROPE.—According to the most recent calculations, the annual increase of the population would present for every million the following table:—

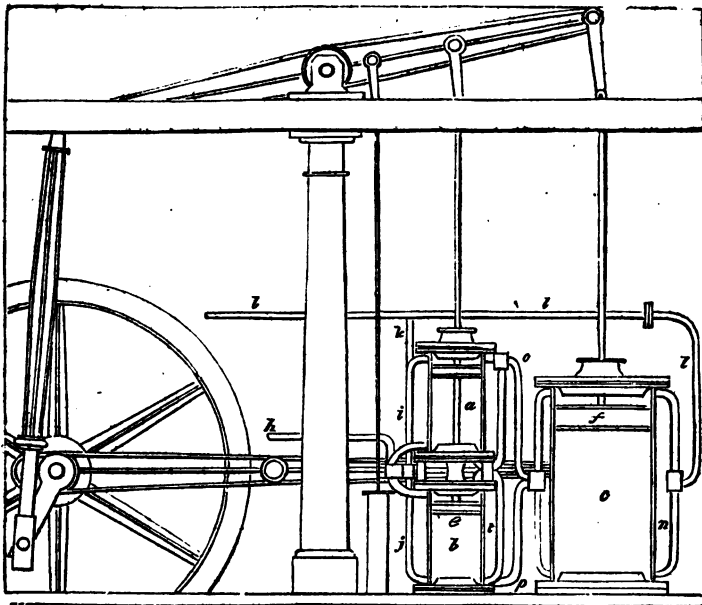
Netherlands 12,372, Austria 10,114, Prussia 27,027, kingdom of Sicily 14,111, France 6,536, Great Britain 16,667, Russia 10,527.

According to this, the population would double itself in

Prussia in 26 years,	Kingdom of Sicily . . in 63 years,
Great Britain 42	Russia 66
Netherlands 565	Austria : 69
	France 108.

GOLD COINAGE.—Eleven parts of gold, that is, standard gold, the specific gravity of which is 19, when mixed with one part of copper, produce an alloy, the specific gravity of which is about 17; of this alloy 20 pounds troy are coined into 934½ sovereigns, or 15 pounds into 700 sovereigns. One pound was formed into 44½ guineas, but now it is coined into 46 sovereigns.—*Brande's Lectures.*

CURIOUS SUN-DIAL.—Mr. John Abram, of Canterbury, teacher of the Mathematics, and author of the Kentish Tide Tables, has constructed a curious sun-dial, which is to be fixed in the front of the Droit-house, Margate, below the transparent clock. The following are the curious properties of this dial. On the upper part is the hour circle, to show the true solar time. Below the hour circle is the Torrid Zone on a large scale, with the parallels of the sun's declination (hyperbolic curves), corresponding to every half hour of the sun's rising and setting. These half hours are again subdivided into quarters of an hour. The time of the sun's rising and setting for the day is indicated by the extreme point of the shadow of the gnomon traversing the corresponding parallel of declination, which, by its diurnal progress over the surface of the dial, also shows, at any given instant, the true bearing of the sun by the compass, indicated by vertical straight lines, marked with different points of the compass. There are, likewise, other parallels of declination, corresponding to the entrance of the sun into each sign of the Zodiac. In short, the dial points out the hour of the day, the sun's place in the Ecliptic, the time of the sun's rising and setting, the length of the natural day and night, and the sun's true azimuth or bearing by the compass.

**PATENT STEAM ENGINE.**

By JOHN UDNY, Esq.—Dated, Jan. 14, 1829.

To convey a concise idea of these novel and ingenious arrangements, we select one on the high pressure plan, on account of its greater simplicity, and because it carries with it the best demonstration of the principle, and the nature of the improvements proposed. This engine consists of three cylinders, all attached by their piston rods to one end of a beam: two of these vessels are smaller than the third, and are placed in the same vertical plane, so that one rod serves for both pistons, by passing through a stuffing-box between the upper and the lower cylinders. These cylinders are marked *a* and *b*; and the third, or great cylinder, is *c*. The first of these two cylinders receive the steam in succession from the boiler, and from them it enters the larger one *c*, and expands into a greater volume. *d*, *e*, and *f*, are the three pistons, with their respective rods, which being on one side of the beam, consequently rise and fall together. *h* is a pipe from the boiler, from which a branch passes to each of the first action cylinders *a* and *b*, entering *a* at its bottom, and *b* at its top, so that the steam, as produced, will act on the under surface of the piston *d*, and on the upper face of *e*. *i* and *j* are two pipes from the top and bottom of *a* and *b* respectively to a pipe *k* common to both, by which any steam that may remain in *a* or *b* after the final expansion, is conveyed into the main tube *l*, whence it escapes into the atmosphere. *m* and *n* are two pipes from the opposite ends of the cylinder *c* to the main tube *u*.

By these arrangements, a communication is alternately opened

between the spaces on each side of the piston *f*, in the cylinder *c*, and the atmosphere. *o* and *p* are pipes from the cylinders *a* and *b*, to a valve-box, from which branches the pipes *q* and *r*, which open into both ends of the expansion-vessel *c*; and by them the elastic vapour which had, in the first instance, acted in *a* and *b*, is conveyed into *c* successively on each side of its piston. *s* and *t* are pipes leading from one end of each of the cylinders *a* and *b* to the other respectively; and by them the dense steam is permitted to expand from the side of the pistons *d* and *e*, on which it had operated from the boiler to the opposite, so as to equalize the density and pressure in these two vessels.

Now, suppose the pistons are required to ascend; then the branch of the pipe *h*, which conducts the steam from the boiler to beneath the piston *d* and the pipe *i*, from above that piston to the air. The steam will, therefore, force up the piston *d* with its full power as it is produced, less the atmospheric pressure, as is the case in the present high-pressure engine; but at the time that this is taking place, the steam which had in the former stroke forced down the piston *e*, and which, after having so depressed it, at the commencement of the movement just described, existed above the piston in a dense state, will be suffered to dilate by the pipe *t*, to under it, so as to make equal pressure on both its surfaces, and admit of its being carried back to the top of its cylinder without any material opposition. The concentrated steam will also be allowed farther to expand through the pipes *p* and *r*, on the under surface of the piston *f*, having the internal surface of the cylinder *b* as a fixed point of abutment, and the pipes *m* and *l* being open to the air, the piston *f* will be raised with the full expansive effort of the elastic vapour. Thus, the patentee observes, "both the power of the steam, as it increases in quantity, and its inherent property of expansibility, are at the same time and constantly obtained. To produce the descent of the pistons, the reverse set of pipes to those named will be opened, and the particularized ones shut," &c.—Now, to estimate the relative value of the present used high-pressure machine and his improved one, let it be imagined that the piston of the first named, and the first-action pistons of this engine, each contain 100 superficial inches; and that steam of 45lbs. per inch over the atmospheric pressure is in each case employed; then the whole power of the old engine would be 4500, exclusive of friction; and the same would be the product of the first operation in the improved machine. But steam of this density (60lbs.) will dilate on four times the surface (the stroke being the same), and still balance the atmosphere: we have, therefore, to add the mean between 45 and 0, on 400 inches, or $22\frac{1}{2}$ lbs. per inch, which will be equal to 9000 pounds more. If 500 pounds be taken off for friction in the present used engine, 4000 pounds will remain; and if 3500 pounds be allowed from this one for the same reason, no less than 10,000 pounds will be left; and large and ample as this deduction for extra friction, &c. is, if even 2000 pounds more be subtracted, the power of this machine would be double that of the present one from the same fuel. In the condensing modification of

the engine, the result will be still greater, and such application of the principle will be easily conceived.

The specification of this patent includes a description of a "safety-boiler," which we purpose giving in a future number.

SMOKE-CONSUMING FURNACE AND COKE OVEN.

By John Walker, jun. of Kennington-cross.

MR. Walker was one of the persons examined before the Select Committee of the House of Commons in 1819, when he stated, that by his plan not only would all the smoke of a furnace be consumed, but a saving in fuel would be effected, equal to 75 per cent. In this plan he stated that he employed coke instead of coal, which he made himself; meaning, it may be presumed, *by the same apparatus*, as the diagrams which he delivered into the Committee apparently represent arrangements for that purpose. No explanation of these was given in the report of the Committee; we are, therefore, left to conjecture the meaning of certain parts, which being neither intricate nor difficult, we shall take leave to submit the following—

FIG. 1.

FIG. 2.

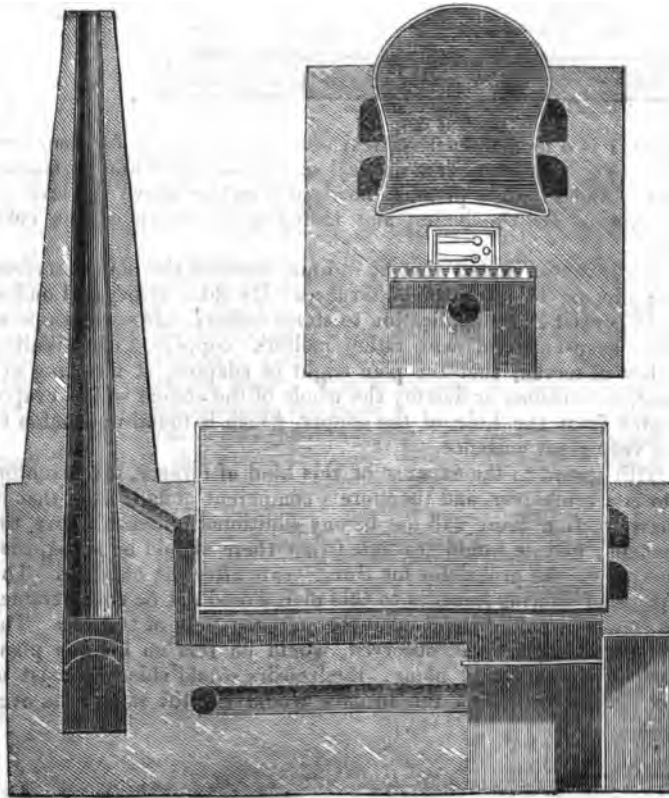


FIG. 3.

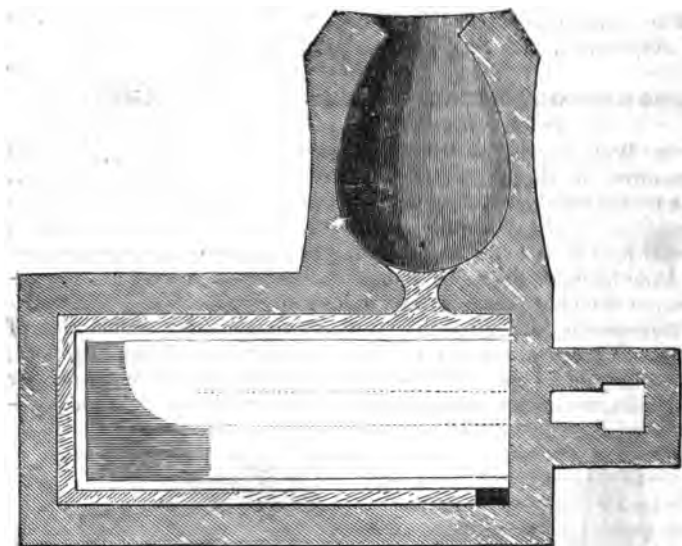


Fig. 1 is a longitudinal vertical section of a boiler, furnace, and flues. Fig. 2, a transverse vertical section of boiler and horizontal flues. And Fig. 3, a plane or horizontal section above the level of the grating for the boiler, and including a section of the coke oven.

The inventor stated that he did not consider the plan described as applicable to all sorts of furnaces; its chief utility in London would consist in its application to steam-boilers, brewers' coppers, stills, soap-coppers, and tallow-melters' coppers. Mr. Walker further observed, that the plan might be adapted, at a trifling expense, to consume or destroy the whole of the stench which evaporates from the hole of the copper, which is found in London to be a very great nuisance.

With regard to the expense of this kind of furnace, the inventor, who is a bricklayer, and therefore a competent judge, said, that in a new erection there will not be any additional expense above the common; and he would guarantee that there should be no expense incurred by the proprietor for three years after the building. The expense of altering furnaces to this plan would not be considerable; the amount would depend upon the circumstances of the case. The expense of repairs, he observed, would be less on his new plans than on the ordinary plans: the repairs would chiefly consist of new fire-bricks, when the furnace would last the same term over again.

ESSAYS ON LITHOGRAPHY.

(Continued from Page 159, Vol. 2.)

Autographic processes.

WE have said, that the autographic process, consists in transferring a writing or a drawing to stone. To effect this, the drawing or writing, is made with ink, on paper; both prepared in the way we have described. A crayon drawing may, on an emergency, be executed autographically; but this mode of procedure is too imperfect to admit of procuring, by its means, neat and perfect proofs. Besides, it is as expeditious to draw immediately on the stone.

In order to write, or to draw on autographic paper, a little of the ink, of which we have given the composition, is diluted in water; taking care to use only rain water, or such as will readily dissolve soap. The dissolution is facilitated by slightly warming the water in the cup; and the ink is dissolved by rubbing the end of a stick of it, in the manner practised with Indian ink. There should be no more dissolved at a time, than will be used in a day; for it does not re-dissolve so well, neither is the ink so good, particularly for delicate designs, after it has been left to dry for several days. This ink should have the consistence of rather thick cream, so that it may form very black lines on the paper; if these lines are brown, good impressions will not be obtained. A sheet of white paper is placed under the hand, while writing, in order that it may not grease the autographic paper.

The stone used for autography should be polished with pumice stone; and the impressions will be neat, in proportion as the stone is well polished. Autographic work may be executed either cold or warm; that is, taking the stone at its ordinary temperature, or making it warm by placing it near the fire, or exposing it to the heat of the sun; if the first means of warming be used, care must be taken, that the fire is not too hot, or it will crack the stone; the temperature given to it should be about that of an earthen vessel filled with lukewarm water. The work may be done, though less perfectly, without warming the stone.

When the stone is thus prepared, it is fixed on the press, and the paper on which the writing is made, is applied to it. The stone may be rubbed with a linen, slightly moistened with spirits of turpentine; and in every case it is necessary that it be made perfectly clean. The turpentine is left to evaporate; and from five to eight minutes before the paper is applied, it is wetted, with a sponge and water, on the reverse side to that on which the writing is done, so that the moisture may penetrate throughout every part. The water, however, must not appear on the paper when it is about to be laid on the stone; but any superabundance which may remain on it, must be removed by a pressed sponge. When the paper is brought to the proper state, it is taken, by both hands, at one of its extremities,

and placed lightly and gradually on the stone, so that there may be no plaits formed in it, and that it may be equally applied over its whole surface. Care must be taken so to fix the scraper, that it may bear steadily on the autographic paper, for if it removes it at all, it will change the place of pressure, and the lines will be doubled. There should be ready at hand, five or six sheets of very even mackle paper, so that they may be changed with each impression. The paper on which the writing or drawing is made, being placed on the stone, it is covered with a sheet of mackle paper, and subjected to a slight action of the press, then to a second, a third, or even to more, until it is believed that the writing is perfectly transferred. At each stroke of the press, the mackle paper, which has imbibed moisture, is withdrawn, and a dry sheet substituted in its place. All these operations require to be performed with expedition and dexterity; particularly when the stone is warm. The next thing is to detach the autographic paper, which will be found adhering closely to the stone. To effect this, it is well wetted with a sponge, so that every part of it may be perfectly penetrated by the water; it may then be removed with facility, entirely detached from the writing, which will remain adhering strongly to the stone. If this operation, which requires some practice, be well performed, there will not be found the slightest trace of ink remaining on the paper. Should there be any lines not well marked on the stone, they may be retouched with a pen; or, which is better, with a hair-pencil and ink: but when this is done, care must be taken that the stone is quite dry.

A part of the sizing of the paper may be found dissolved, and adhering to the stone; this may be removed by washing, or slightly rubbing it with a wet sponge. The stone is then prepared with aqua fortis, and the impression taken in the way we shall describe in another number of this journal.

Autography is not confined to the transferring of writings or of drawings done with autographic ink. By its means, a transfer may be obtained from a sheet of ordinary printed paper, and with such exactness, that it would be impossible, excepting to well practised eyes, to perceive the least difference between that printed in the usual way, and that which was the result of the autographic process. This mode is very useful when it is desired to unite oriental characters, which we may not possess, with words, phrases, or lines, composed in our ordinary typography. We have thus executed many pieces in which the French, or the Latin language, was intermixed with words, or phrases, in Chinese, or Arabic. We have, in the same way, executed a typographic map, in which all the details were lithographic, while the names of places were at first produced by typography, and afterwards by autography. This operation is begun, by composing, and arranging, in a typographic form, the words, the phrases, or the lines, as they ought to stand. The autographic paper is printed on by this form, and the words in the oriental languages are afterwards written in the spaces which had

been left for them. The whole is transferred to a stone, which is prepared for the purpose, and from which the impression is taken, in the usual manner. The same mode is pursued in making geographical maps. After having printed the names, on autographic paper, the other parts of the map, but without the names, are drawn immediately on the stone; and after having printed the names on white paper, the map, drawn upon the stone, is printed on this same paper.

Maps, or line engravings on copper, where the work is not very close, may be multiplied in a similar way. For this purpose, the plate of copper is covered over with the autographic ink, diluted to a convenient consistence. Instead of the autographic ink, a composition is sometimes used, made of one ounce of wax, one ounce of suet, and three ounces of the ink with which the ordinary impressions in lithography are taken. The whole is warmed and mixed well together, and there is a little olive oil added to the composition, if it is not liquid enough to spread itself over the plate. The plate ought to be warmed as usual. After having taken the impression in the rolling-press on a sheet of autographic paper, the transfer may be immediately made on the stone, after having rubbed it with a sponge, dipped in turpentine. It is necessary to give three, four, or even more, strokes of the press, increasing the pressure at every successive stroke; the other processes, which we have already described, are likewise to be followed. It is well to wait twenty-four hours before *preparing* the stone, in order that it may be better penetrated by the transferring ink; it is then gummed, and washed, and is ready for use.

This process, which has not yet come into use amongst lithographers, merits the attention of artists; for it affords the means of reproducing and multiplying geographical charts, and some kinds of engravings, indefinitely; so that they might be furnished at a quarter of their present actual value. In fact, all those which are done in lines, or those in which the shadows are boldly executed, are capable of reproducing good impressions by means of autography. The operation becomes extremely difficult when it is necessary to transfer fine line engravings; the lines of these are so delicate, and so near to each other, that they either do not take well on the stone, or are apt to be crushed and confounded together, by the effect of the pressure. Much practice and address are necessary to obtain tolerable impressions; and this part of the art requires improvement. We have, however, succeeded in transferring to stone, a small, highly-finished engraving, which had been printed on common half-sized paper. After having dry-polished a stone, very perfectly, we warmed it, rubbed it with spirits of turpentine, and applied the engraving to it. This, however, had been previously dipped into water, then covered, on the reverse side, with turpentine, passed again through the water, ~~so~~ as to remove the superfluous turpentine, and then wiped with unsized paper. In this state, the engraving, still damp with the turpentine, was applied to

the stone, and submitted to pressure, when it afforded us very good impressions; the *preparation* not being applied until it had remained on the stone for twenty-four hours. The difficulties increase, of course, in proportion to the size of the engravings which it is desired to transfer to the stone.

Attempts have been made to transfer old engravings; they have, however, succeeded but imperfectly: it would be rendering an essential service to the art, to discover a mode of reproducing old engravings by means of autography; the thing presents great difficulties; still, from the attempts of the kind which we ourselves have made, we think it possible to succeed. It shall suffice us, at present, to give some account of the mode we pursued. The ink of old engravings being brought to a state of complete dryness, it is necessary to give it a body, and unctuousity. To effect this, the engraving may be well soaked in water in which some soda, sal ammoniac, or salt of sorrel, has been dissolved. The engraving is then stretched out on a plank, and spirits of turpentine spread over it; pressing it in with the finger, or the palm of the hand, so that the lines of the engraving may be perfectly impregnated with the turpentine: it is then laid on a warm stone, submitted to pressure, and removed from the stone by wetting it with water. If the engraving has been made too wet, it should be gently pressed between some sheets of unsized paper, before placing it on the stone. It should be inked afterwards with the roller, or, which is better, with the *retouching ink*, of which we have given the composition. For this purpose a printer's ball is used; these are made of wool, and covered with thin, untanned leather.

The autographic process presents great advantages in a variety of circumstances, and in different kinds of work; particularly when economy and expedition are necessary. It is especially adapted to the circulation of all such writings as require an immediate publication; such as advices relative to commerce or to private or public interests; to memoirs, or to scientific or literary communications, &c., which are only intended for a small number of persons; any one might have a press and use it by himself, or with the assistance of his agents or his servants. In this manner, and in a way the most economical, geographical charts, geometrical figures, and every kind of design made with the pen, might be produced. Authors who have any knowledge of drawing, might themselves execute their works on autographic paper, without having recourse to artists: for it requires a certain apprenticeship to be able to write or draw backwards with ink on a stone.

NEW IRON BRIDGE,

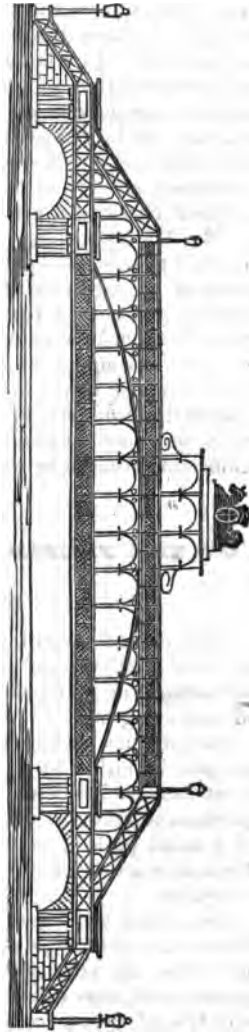
By THOMAS MOTLEY.

We have had the pleasure of inspecting, at 460, Strand, where it is exhibited, the model of an iron bridge, on a principle very similar to that recently introduced for roofs of buildings by Mr. George Smart, and called by him "*the bow and string rafter*," described in the first volume of the REGISTER OF ARTS, N. S. page 28, constructed by Mr. Thomas Motley, as a design for a bridge to be erected across the Thames, from Scotland-yard, on the Middlesex side, to the King's Arms, on the Surrey side.

The model, which represents one arch of a series, or a complete bridge, for a span of about 200 feet, is upwards of twenty-two feet long, and made to a scale of an inch to a foot.

The design represented by the annexed engraving, is intended by Mr. Motley as an ornamental bridge for parks and pleasure-grounds. A mere inspection of the drawing will be sufficient to show the principle of construction, which evidently consists in a combination of the principles of compression and tension, whereby avoiding the necessity of abutting properties in the pieces or wall on which it rests; and as the arch represented by the curved line is confined between two parallel lines, and those lines connected together by vertical bars, to which the arch is inflexibly attached, and the parallel bars or lines also inflexibly jointed, and the whole combined by strong bolts at the top and bottom of every vertical bar, rendering it a skeleton of a trussed beam; thus affording an opportunity of having two paths across the river, the lower of which he proposes to use as a road-way for carriages, &c., and the upper as a foot-way or promenade.

It must be evident, observes Mr. Motley, that this mode has many advantages over the inverted arch or chain-suspension bridges, possessing more stability, safety, and durability, which is principally derived from the circumstance of the stress or pressure being removed from the highest point of the fabric (the tower or



wall over which the chain passes), to the lowest point where the union of the two principles of compression and tension takes place, the whole combination being capable of inflexible construction, it is not liable to oscillate or undulate, defects inseparable from chain suspensions, which must necessarily tend to lessen their durability. With respect to a second floor, it does not constitute an absolutely necessary part of the structure; but if it is not adopted, it will be needful to have diagonal braces placed horizontally to stiffen the upper part. In a large town or city where the situation is central, the introduction of an upper floor, with an arcade of shops, &c. must be an important consideration, as it affords an opportunity of making the bridge produce a rental perhaps equal to the interest of the whole of the expense of the undertaking, producing the hitherto unknown novelty of a new bridge remunerating the proprietors without charging a public toll, at least on foot-passengers.

Mr. Motley's bridge, though somewhat similar to the iron bridge erected across the Thames at Vauxhall, differs from it in the introduction of bars constituting a tie-beam to each arch by which the lateral pressure is transferred to a perpendicular pressure on the piers, a circumstance of the greatest importance in the construction of roofs resting on walls subject to be forced out by lateral pressure, and also in the erection of bridges under circumstances where the addition of bars in the form of tie-beams would be less expensive, or more convenient than the introduction of abutments of sufficient strength to secure the stability of the structure.

ON THE PREPARATION OF COLOURLESS REFINED OX-GALL.

By P. W. TOMKINS, Esq.

THE refined ox-gall possesses all the valuable properties of ox-gall, as applicable to painting in water-colours: with the superior advantages of being deprived of all tendency to putridity, and of all colouring matters.

It combines with, and fixes all water-colours, as they are usually prepared; either by being mixed with them, or washed over them after they are laid upon the paper, &c. It renders blue, purple, red, green, and all other delicate colours, more bright and durable; and if a small portion of it be added to any of the colours, it causes them to wash more freely and evenly over the surface of the paper, ivory, &c.

Combined with gum-arabic, it gives depth of tint, without any unpleasant glossiness upon the surface of the drawing, prevents the gum from cracking, and the colours are so completely fixed in the paper itself, that subsequent tints can be washed over them, without any risk of their becoming foul, or forming improper combinations with the under colours.

Combined with fine lamp black and gum-water, it forms a complete substitute for Indian ink.

If it be floated over the surface of drawings made with chalk, or black-lead pencil, it fixes them firmly; and they may then be washed over with any water colours, previously mixed with a small portion of it; without, in the least degree, disturbing the chalks or black-lead.

For miniature-painting, being washed over the surface of the ivory, it completely removes its greasiness; and being mixed with the colours, it causes them to float thereon; and tints may be laid over tints, the colours being struck into the ivory.

For transparencies, oiled paper being first washed over with the refined ox-gall, and permitted to dry, water-colours, mixed with some of it, will be freely and perfectly smooth upon it; and be so fixed, as not to wash up by the repetition of different glazings of colours over each other, thus producing depth of colour.

In short, the valuable properties this refined ox-gall possesses, make it equally applicable to historical landscape, botanical, and natural history painting, as well as to colouring prints in general; and by its readily combining with all the vehicles used in the preparation of water-colours, and having no colour itself, it enables the artist to paint with ease, on surface, otherwise unfavourable; at the same time rendering the colours more bright and durable.

Many other valuable properties will, no doubt, on trial, be found in this preparation; and the result cannot fail to facilitate and improve the art of painting in water colours: and, as the discovery of it is entirely new, it will in all probability, be found applicable to many other useful purposes.

Process for depriving ox-gall of its Tendency to Putridity, and of its Colouring-Matter, so detrimental to all delicate Colours.—To a pint of fresh ox-gall boiled and skimmed, put one ounce of alum, finely powdered; continue it on the fire until combined: when cold, put it also into a bottle, and cork it moderately close.

To another pint of fresh ox-gall, also boiled and skimmed, put one ounce of common salt, and continue it on the fire until combined; when cold put it also into another bottle, and cork it moderately close.

Gall, thus prepared, will keep perfectly free from putridity, or any offensive smell for years.

When the above preparations have stood in a room of moderate temperature, for about three months, they will deposit a thick sediment, crusts will form on their surfaces, they will become clear, and be fit for use in ordinary purposes; but as they contain a large proportion of yellow colouring matter, tinged blue of a greenish hue, reds brown, and sullied purples; they are unfit for general use, in painting in water colours.

Further process.—The before-mentioned preparations, after standing until they are become perfectly clear, are to be decanted, and combined in equal proportions; a thick coagulum is instantly formed, of the yellow colouring matter, which precipitates, leaving a clear liquid, namely, the colourless ox-gall.

N. B. After the combination of the two first preparations, the

process may be assisted by filtering the liquid through a paper. Age renders this preparation more brilliantly clear; and from it, it seems to obtain an agreeable scent: nor has it been observed to contract at any time an unpleasant smell, or to lose its useful properties.

KALLIFTHORGAN, A NEW MUSICAL INSTRUMENT.

THIS instrument, which is invented and made by a Mr. Fred. Fielig, is played upon in the same manner as the piano-forte, by means of a finger-board; but any person who heard it, and did not see how it was managed, would imagine that he was listening to a quartett, the parts of which were executed on the violin, the tenor, the violincello, and the double bass. The way in which this effect is produced, is, by a rosined bow of horse-hair, being, through the agency of a pedal, passed over the strings of the instrument, which are formed of catgut; and we only speak the truth, when we say that the instrument, when played upon by the inventor, could not be distinguished by a listener from a performance upon the violin, tenor, &c. The Kallifthorgan has a compass of considerable extent, from the highest note of the violin to the lowest note of the double bass; the middle part of the finger-board taking the notes of the tenor and the violincello. There is of course a separate string for every note, and the Kallifthorgan is, in this respect, inferior to the four above-mentioned instruments, because no performer upon it can insensibly slide from one note to another, in the same manner as a performer upon the violin can; for in this new instrument, as in the pianoforte, every different note has a separate string. It is well known that many instruments have been constructed, both in this country and abroad, on the same principle as the invention we are now speaking of. The idea was originally started in Germany, and was, we believe, first practically developed in that country; but as far as we know, none of the instruments hitherto made on this plan, arrived at that perfection, to which Mr. Fielig has succeeded in carrying his invention: for though they could be made to produce a continued tone like the violin, they failed in giving the swell, which can be so exquisitely produced upon that instrument. But in the Kallifthorgan the difficulty is overcome; and though the instrument produces notes of the most delicate and melodious tone when the keys are lightly touched, yet the most powerful sounds may be brought forth, either suddenly or gradually, by increased pressure. This instrument, therefore in the hands of a judicious player, who understands how to manage it, is capable of the highest expression. Such, at least, was our impression on hearing the Kallifthorgan in a private room. It remains to be seen what effect it will produce on a public audience, and we understand, it is to be immediately put to that test. The inventor displays much taste and judgment in his performance on this instrument, a perfect knowledge of the powers of which he may be supposed to possess.—*The Times.*

LIST OF PATENTS RECENTLY TAKEN OUT.

PATENT METHOD OF MAKING NAILS. By EDWARD HANCOME, of *Skinner-street, London, Nail Manufacturer.* Dated 9th October, 1829.—This invention, which is the communication of a foreigner residing abroad, consists in a machine made of two horizontal frames, the one moveable, and the other fixed—an axis with a crank, a cam, a fly-wheel, and drum. The bearings of the axis are attached to the lower or fixed frame, and the crank is connected with, and causes the upper or moveable frame to traverse in grooved guides on the lower. From an iron rod, of an appropriate size, placed hot into the machine, a piece, the size required for a nail, is cut off by two cutting edges brought together by the motion of the upper frames, and held between two steels, while the head of the nail is formed by the action of a kind of hammer, whose face is shaped like a die into the form required, and whose stem is acted upon by a kind of cone on the axis. The nail is then to be tapered or pointed by the action of two eccentric steel sectors, whose circular surfaces are placed, at the commencement of the operation, sufficiently apart to receive the thickest portion of the nail, and at the termination of the operation, when they are brought by the motion of the upper frame, in a position with the point of contact, is nearly in a line between the centres of motion.

CLEARING WATER-COURSES.—W. Farish, Professor at the University of Cambridge, specified on the 4th March, his improved method of *clearing water-courses*, which consists in detaining the water which is to pass through any course or drain, in a tank or other appropriate vessel, until it accumulates and rises to a certain elevation, when it is made to disengage itself by opening a sluice or other contrivance, and empty itself instantaneously, and thus wash away any deposit which may have been left in the drain or course. The patentee describes two methods of effecting the instantaneous discharge of the water, but he does not claim either, as any method of discharge most suited to the localities of the drain may be used.

PATENT IMPROVEMENT IN THE MANUFACTURE OF STICK SEALING-WAX. By PETER RIGBY WASON, Esq., of the *Middle Temple, London.* Dated 25th September, 1829.—This invention consists in the introduction of a small wick of straw or any other suitable material into the stick of wax, which is to be made of equal parts of shell lac, vermilion, and venice-turpentine; which are to be melted together over a slow fire, formed into pieces by rolling a portion on a hot copper-plate. A longitudinal notch is then to be made in the stick to receive the wick, which being introduced, the stick of wax is to be rolled into a cylindrical form on the hot plate, or shaped into any other form, by being pressed into a mould and stamped with any required impression.

The patentee does not claim the method of manufacturing the sealing-wax which he has described, but simply the introduction of the wick to render it more convenient in application.

PATENT IMPROVEMENTS IN THE APPARATUS FOR MANUFACTURING COAL GAS. BY JOHN BRUNSTON, of *West Bromwich, Staffordshire, Engineer.* Dated 2d October, 1828.—Mr. Brunston's specification describes five improvements in the construction of gas apparatus; he proposes to introduce, First, conical retorts, for generating the gas, to be placed with their bases downwards, in order to facilitate the operation of emptying the coke out of them, after the gas has been extracted; Second, the introduction into each retort of a conical pipe, perforated with holes, and communicating at the top with the gas-pipe, to aid the escape of the gas when the coals, of which it is made, are small: Third, the construction of the furnace doors, which he makes of two parts to meet in the middle, making with each other an obtuse angle, like the flood-gates of a canal lock. The one-half is placed over the other, so that the upper part need only be opened for feeding the fire, and the lower part for clearing out the furnace: Fourth, a method of constructing the hydraulic main, to prevent injury to its flanches, arising from the expansion to which it is subject, from the different degrees of heat which it receives. This improvement consists in making one part of the tube moveable within the other, with an air-tight joining, and supporting the moveable portion on a lever and a weight, which will rise and fall as the tube contracts or expands: And, Fifth, in the general arrangement of the apparatus, which consists in placing the retorts and furnaces in such a manner, that the coals can be supplied to them, and the coke and ashes removed from them, without exposing the workmen to so much heat as they are exposed to in the usual method of manufacturing gas.

SPINNING.—J. Rhodes, jun., of Alverthorp, Wakefield, specified, on the 18th March, his patent for improvements in the machinery for spinning and twisting worsted yarn, and other fibrous substances; consisting of arrangements connected with a heart motion by which the bobbins are made to traverse on their spindles, that the thread may be evenly wound upon them; and by which, when the bobbins are full, the train of levers can be detached from the heart, and the bobbins permitted to descend, clear of the spindles, which are placed with their points downwards, removed and replaced by empty ones with great facility.

CARTRIDGE.—E. F. Orson, of Princes'-square, Finsbury, specified, on the 18th March, his patent for an improved cartridge for sporting purposes, consisting of a cylinder for containing the charge of shot in the fowling-piece, made of card or strong paper, with longitudinal slits through which the shot is prevented from passing: the piece is discharged by a covering of thin paper pasted on the exte-

rior and by a circular wadding of card, placed in each end of the cylinder. The intention of this patent is to prevent the shot from being too much scattered, or thrown in clusters, before they reach their destination.

MISCELLANEOUS INTELLIGENCE.

SUPPOSED EXISTENCE OF ACTIVE MOLECULES IN MINERAL SUBSTANCES.—In a communication to the Magazine of 'Natural History,' Mr. Bakewell throws doubts on the supposed existence of active molecules in inorganic matter, as propounded by the eminent naturalist, Mr. Brown. With regard to these active molecules, though, in some instances, Mr. Bakewell was at first persuaded that he had seen the motions of the molecules similar to those of the smallest species of Infusoria, a more careful examination proved that he was mistaken, and that the motions were derived from causes that had not been properly appreciated. These motions Mr. Bakewell describes as arising generally from animalcules in the water used in the experiment, from external vibratory motion, very difficult to be guarded against, and the effects of which, in London, it is scarcely possible to avoid, and from currents of air, which the observer's breath is sufficient to produce. As to London dust, the whole of which Mr. Brown asserts is composed of active molecules, Mr. Bakewell says he is fully convinced that the activity of its particles in a drop of water, as well as when dancing in the sunbeam, is derived from external agitation. Mr. Bakewell, however, acknowledges the obligation which the philosophical world are under to Mr. Brown, for having directed the attention of naturalists to this subject; and further says, that 'about ten years ago, Mr. Bywater an ingenious optician, now residing in Liverpool, was reported to have discovered moving animalculæ in coal-ashes, pounded marble, and other mineral substances.' Little interest was then excited by the supposed discovery; it required an eminent naturalist like Mr. Brown, whose merits are well known and highly appreciated in his own country and on the continent, to direct public attention to statements so much at variance with our preconceived notions of matter. If, contrary to expectation, after all due caution in the observations, it should be finally established that mineral substances are composed of active molecules, what new views of nature will the discovery unfold! Beds of siliceous sand, like those on our Hampstead Heath, are only awaiting a farther process of trituration, to be awakened into life by the torrent that shall bear them into the ocean; and the geologist, while he contemplates the organic remains of a former world imbedded in solid rocks, must regard the rocks themselves as the parents of future living beings. Mr. Brown's discovery is, that the ultimate particle he can obtain from all bodies, organic or inorganic, has inherent motion, like unto vital action. His ideas on the subject, with an account of the mi-

microscopical observations which led to them, are set forth in an unpublished pamphlet, a review of which may be found in the above-mentioned Magazine. Mr. Bakewell reports that, on repeated observations on several mineral and inorganic substances, he had not discovered any proper motion of the molecules, if the water had been recently boiled: he attributes the apparent motion in unboiled water to animalcules previously existing in the water.—*Journal of Facts.*

NEW COACH.—A French paper states, that a patent has been taken out in Paris for a new coach, with one wheel only, capable of accommodating from thirty to forty passengers.

MAGNETISM OF THE EARTH.—A young natural philosopher, of the name of Babinet, has been recently employed in a series of experiments, with a view of ascertaining the magnetic power of the globe. He has communicated to the French Academy, as the result of his investigations, the following theorem:—"A magnetic pole, which, at the distance of a *mètre*, acts on a pole equal to itself with the power of a *milligramme*, is governed by the earth with a horizontal power of three hundred and twenty *milligrammes*."—*Le Globe.*

NEW PYROMETER.—A new air-thermometer has been invented by M. Pouillet, for the purpose of measuring degrees of heat in very high temperatures; an object hitherto of very difficult attainment. By means of this instrument it has been ascertained, that the heat of melted silver is 1677°; of a melted mixture of one part gold and three parts silver, 1803°; and of melted pure gold 2096°.

INFLUENCE OF TEMPERATURE ON THE MORTALITY OF NEWLY-BORN INFANTS.—MM. Villermé and Milne Edwards have addressed to the Academy of Sciences of Paris the result of their inquiries into the influence of temperature on the mortality of newly-born infants. Mr. Edwards, sen. had asserted that in animals of warm blood the heat-producing faculty is at its lowest point at the period of birth; and that, in general, in the first stage of life it is so feeble, that the temperature of the animal cannot be kept up when it is exposed to powerful causes of cold. M. Villermé and Milne Edwards had subjected this proposition to the test of statistical inquiries. They compared the mortality of infants in the north with that in the south of France, and found that it was greatest in the provinces in which the climate is coldest. Taking the whole of France, and making the comparison between the seasons, they had discovered that it was always in the coldest season of the year that the deaths of children under one year old were most frequent, while from one year old to an advanced age the contrary was the case. The attention of the Legislature, and of the ministers of religion, is called to this circumstance, and suggestions are made of the danger incurred from the custom of taking children at too early a period after their birth to the church for baptism, or to the Mayor's office to be registered. In France, the latter is required to be done within three days after birth. In cases of death, the public officer is required to attend at the house; and why, it is asked, should not the same practice be observed in the case of birth?

**UDNY'S PATENT SEA STEAM-ENGINE GOVERNOR
AND SELF-WORKING SHIPS' PUMPS.**

TO THE EDITOR.

13, Arbour Terrace, 4th April, 1829.

SIR—Observing in your last REGISTER an account of one modification of my Patent steam engines, and a promise that my safety-boiler will be noticed in a future number, I beg to direct your attention to another patent of mine, in which there is a sea steam-engine governor, or regulator, and to my self-working pumps, on the same principle, a description, and drawings of which, I herewith send you.

I am, Sir,

Your most obedient servant,

J. UDNV.

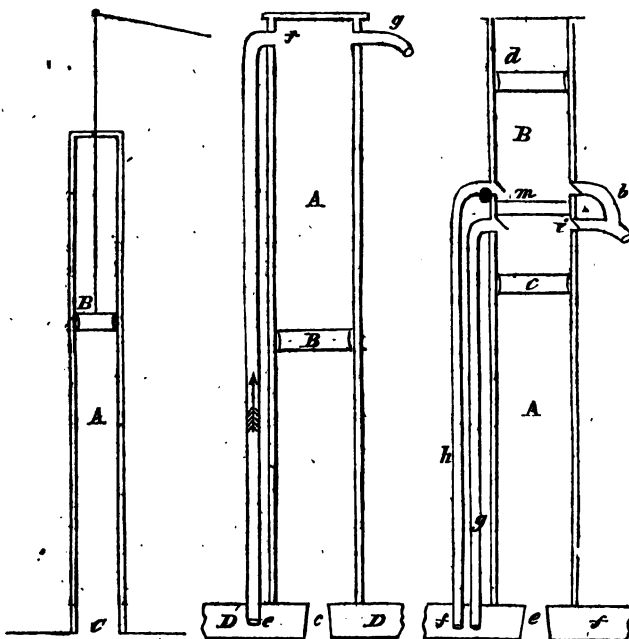


Fig. 1. A, a small cylinder placed vertically in the vessel before the engine, open to the sea at bottom, as at c.

B, the piston with its rod which is connected to the lever of the throttle-valve. The piston rests on the surface of the water, and when the vessel pitches it is forced up, and opens the throttle-valve so as to admit an increased flow of steam to the engine. When the ship rises out of the sea, the piston sinks, and shuts the valve, and thus proportions the quantity of steam admitted, to the necessity for it.

No. 1, Single Pump.

A. Cylinder shut at top placed vertically in the vessel near the bow, opening into the sea at the bottom, as at C.

B. The piston, which should be somewhat loaded.

D. The well in the ship's hold.

e, pipe from the well to the top of the cylinder, having a self-acting valve, *f*, opening into the cylinder.

g, pipe to the air, having a self-working valve opening outward.

The water will ascend in the cylinder to the level of the water line outside, and the piston B, will rest on its surface, when the ship plunges in a sea, the piston will be forced up, the valve *f*, shut, and that on *g* opened, and through this last-named pipe the water above the piston will be driven into the air. When the vessel rises, the sea will leave the piston, which, from the vacuum below it, its gravity, and the pressure above it will fall, the valve on *g*, will then shut, and that of *f* open; the water in the well will then rise through the pipe *e*, into the space above the piston B, and thus alternately will the piston be raised and depressed by the pitching of the vessel; and the vessel be kept dry; for if the rise and fall of the ship be twenty feet, the diameter of the cylinder thirty inches, and the ship pitches once in a minute, no less than two tons will be thrown out in that space of time.

The double pump consists of two cylinders in the same vertical plan (as A and B,) divided by a partition *m*, the upper cylinder being open at top—they have both pistons as *c* and *d*, joined by the rod, *n*; the pipe *g* runs from the well to the top of the lower cylinder, and *h*, from the well to the bottom of the higher one, while *i* and *l* run from the two cylinders to the air, all being provided, (as in the other case,) with valves. *f* is the well, and *e*, the pipe through the bottom to the cylinder. Now the ascent of the pistons, produced by the action of the sea on the lower piston, fills the upper cylinder, and drives the water out of the lower one, and the descent of the pistons in consequence of the vacuum under the lower piston, and the pressure of the atmosphere on the higher one, fills the under cylinder, and empties the upper one, &c. The upper cylinder may be shut, and the air will be condensed above it, by the elevation of the pistons; and this air will re-act to produce the descent of the pistons. There are several other varieties, but these are the most simple, and quite sufficient to answer the purpose required.

N.B. In the single one no piston is requisite—the vessel for the sea to operate in may, therefore, not be a cylinder, or regularly bored vessel—and a cock may be placed on each pipe so as to shut off the sea when wished.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from Page 276.

THE engravings, necessary to illustrate the plan, next invented for consuming smoke, not being yet executed, we proceed in our

subject, by introducing the interesting evidence of Dr. Tuthill, given before the Committee of the House of Commons in June 1819 :—

“ Have you turned your attention to the unhealthiness arising from smoke ? ”—“ I believe the atmosphere of London to be prejudicial to health ; the accounts which have been published at different times, concerning the relative duration of life in London and in the country, may be considered as having proved that duration to be considerably diminished, by a residence in this metropolis. It is probable that this depends upon the atmosphere of London. There are a great variety of causes, which contribute to render that atmosphere unfavourable to health ; and I think we may be warranted in assuming, that whatever we can discover in such atmosphere, so as to render it different from that of the country, may contribute to produce this effect ; and therefore it becomes probable that the quantity of carbonaceous matter suspended in it, is one of the causes of its insalubrity. The rapid advancement to recovery which we frequently see in sick persons, during a short residence in the country, proves the influence which the atmosphere of London has upon health ; there are many diseases incident to the human body, in which the influence of that atmosphere may be more easily detected, than in a state of health. In certain diseases of the lungs, especially, I think it may be proved that the smoke of London is prejudicial. I conceive that the fog peculiar to London, so different in its sensible properties from any fog in the country, depends upon the smoke of the metropolis, and is prejudicial in many diseased states of the lungs.”

“ If you have looked into the bills of mortality, on contrasting London with other capitals in Europe, do not persons live longer in London, in proportion, than in any other capital in Europe ? ”—

“ I do not know the relative duration of life in the different capitals of Europe ; but I do not think it would prove that the smoke of London is harmless, supposing longevity were in favour of London.”

“ Is there no other circumstance affecting the lives of persons in great cities, besides the smoke ? ”—“ Certainly ; a great variety.”

“ Do not you know, that in smaller towns, the people quit those smaller towns for the benefit of the air in the country ? ”—“ That benefit, I think, is not so remarkable, as in such persons who leave London for the country.”

“ Do you not think, so many persons breathing on the same ground, might operate on the health of individuals breathing the same air ? ”—“ The greater be the quantity of carbonic acid gas in a given volume of air, the greater would be the insalubrity of that air. But in crowded cities, the air is contaminated from a variety of other causes, which chiefly owe their origin to the exhalations, either from the living animal body, or from decomposing animal and vegetable matter, when the principle of vitality is extinct.”

“ In two towns in the country, where there appears to be more smoke than in London, in Birmingham and Manchester, have you examined the bills of mortality ? ”—“ I am not acquainted with the bills of mortality, either in Birmingham or Manchester.”

"Do not you think the goodness of the water, as one of the principal effects upon the health of the inhabitants of a city?"—"Certainly; that has a great effect."

"Have you turned your attention to any mode, by which those violent tornados of smoke emitted from furnaces, might be prevented?"—"I believe it possible to prevent them."

"Must not that very thick volume of smoke, emitted by furnaces, brewhouses, soap manufactories, gas houses, &c. be exceedingly prejudicial to the health of the inhabitants?"—"I believe it to be prejudicial."

"Much more so than the common smoke, evaporated by ordinary flues?"—"That depends entirely upon the quantity of carbonic acid gas, which is produced by the combustion of so large a quantity of coal."

"Can you state any particular plan or system you would recommend, to prevent these injurious effects?"—"I conceive the smoke arising from such furnaces might be prevented; that is, that the carbonaceous matter which issues from such chimneys, and now mixes with the atmosphere, may be converted into carbonic acid gas."

"Have you turned your attention to any mode of effecting that?"—"I think it can be effected, by making the smoke pass through an ignited tube, whilst the combustion of the soot is there assisted by a fresh current of atmospheric air. I see no reason why a simple apparatus may not be so contrived, as to render that combustion complete. But it appears to me, to be deserving of consideration, whether this annihilation of smoke ought to be confined to manufactories. If, instead of burning common coal, that fuel were first divided, as it now is in the gas-light manufactories, into coke and carbonated hydrogen gas, and these were afterwards consumed in union, the brilliancy and warmth which we now enjoy by our fire-sides, would, to say the least, be undiminished, whilst the smoke would be entirely destroyed. This may be tried without any difficulty, by the judicious admission of gas into a common grate filled with coke; the materials in fact would be the same as of our common fires, but employed in a state of greater purity. There is no limit to this mode of destroying smoke: and should a plan of this nature be hereafter adopted, chimnies as they are now constructed, would be quite unnecessary; a small tube would be sufficient."

"The complaints produced by smoke, you are of opinion, are chiefly consumptions?"—"My answer to a former question seems to have been mistaken: I merely stated, that persons affected by diseases of the lungs, suffer from the air of London; asthmatic persons, for example, are often seen severely affected by London fogs."

"Do you think it creates asthma?"—"I do not know that it creates it; but there are different causes which probably concur to produce diseases, and those may be capable of exciting asthma in a person subject to it, which would not produce it, where no predisposition existed."

"Have you been in the habit of burning wood-fires?"—"Not in this country."

"Do you find any difference between a wood fire and a coal fire, in respect of health?"—"It is from the many atmospheric causes by which health is disturbed, scarcely possible satisfactorily to answer this question: but even supposing all other disturbing causes in the atmosphere of two great cities, such as London and Paris, to be the same, it is obvious, that the smoke from coal fires would from its being a constant source of annoyance, be objectionable."

"How a constant source of annoyance?"—"By producing painful sensation, and consequently diminishing human comfort and happiness. It is the constant source of complaint by foreigners, upon their arrival in London; and although we are now accustomed to the evil, it was the cause of great complaint upon the introduction of coal fires into our metropolis, as appears by a small volume, published by Evelyn in 1661, for the very purpose of preventing the evil, to which the Legislature may possibly now think it expedient to endeavour to apply some remedy."

"Have you known particular instances of persons' healths suffering, by living in the neighbourhood of any of the engines referred to?"—"No; I have not."

"Do you know whether there is any difference in the chemical effect upon the air, between a wood fire and a coal one?"—"If the coal employed contain sulphur, that will affect the products of its combustion; and pyroligneous or acetic acid, holding a little essential oil and ammonia in solution, may be produced during the combustion of wood, and mix with the atmosphere where the latter fuel is employed."

"Does it rarefy the air more?"—"I believe not."

"A fire constituted with material, such as you have alluded to, would not have any bad effect upon health, would it?"—"No more than the production of carbonic acid gas, which would be equally produced in the burning of wood. The atmosphere of London might then become as clear as that of the country; and if required, the carbonic acid gas might be conducted away to any distance."

PATENT IMPROVED RAIL-WAY CARRIAGE.

By W. HOWARD, Esq. of Baltimore, United States.

BE it known that I, the said William Howard, have made, invented, constructed, and experimentally applied to use, a new and useful improvement in the construction of carriages, intended to travel upon rail-ways, called by the name of "the Improved Rail-way Carriage," specified in the words following: that is to say, To render more useful the establishment of a rail-road through a broken country, it has been a desideratum to construct a carriage which shall move with as much facility upon a serpentine, or curved, as on a straight road, and, at the same time, not to lose the peculiar advantages which the common method of fixing the wheels on the

axis, possesses. It is also desirable to lessen, if possible, the amount of friction, by means not too complex for general use. These two ends it is proposed to attain in the construction of the waggon hereafter described, upon the principles now set forth. These principles are as follows:—

1st. The connexion of the two beds of the axles at a point equidistant from each; and in the same manner the connexion between the hind bed of one waggon, and the fore-bed of that following it, or the fore-bed of the leading waggon with any system of guide-wheels, so that the wheels, not only of one waggon, but of a train, will follow one another in the same curve, without more lateral friction than when on a straight line.

2. The making the axle revolve in its journals, and at the same time rendering either one or both wheels capable of revolving independent of the axle, as in a common carriage.

3. The application of a simple friction-wheel, to diminish the friction of the axle on its journal.

To explain these principles in detail—

1st. If there be a track of a rail-road of a circular form, and we wish a carriage to move on it without lateral friction, the planes of the wheels must be parallel to the tangents of the two circles at the points where they rest on them, and each axle, consequently, in the direction of the radius of the circle. To find the point at which the axles must be connected to produce this effect, draw a perpendicular from the middle of each, and the intersection of these two perpendicular lines will be the point of junction required. The advantage of this over the common construction is, that there the pivot of the beam connecting the axles, is on the foremost axle, and, consequently, in turning, the hind wheels do not follow the tracks of the foremost ones, but describe a curve of smaller radius, causing great lateral friction on the rails.

2nd. The principle of making the wheels revolve with or without the axles in the present case is, to secure the advantages of the axle generally revolving with the wheels, and at the same time to permit one wheel to revolve faster than its fellow, when moving on a curved part of the road. The trifling relative movement which this would produce between the axle and the wheel, would admit of these being adapted with considerable exactness.

3rd. In the application of the friction-wheels, instead of an axle resting on the summit of a wheel, as is the usual method of application, and the only one known to the inventor, the wheel with its load is here made to rest upon the axle.

According to these principles, the combination of which into a rail-way carriage forms the ground of the patent claimed by the inventor, the carriage itself would be constructed as follows:—

The size of the wheels, their distance apart, and the distance between the axles, are in the common proportions used in rail-way carriages. The connecting beam between the fore and hind axles, is fastened firmly thereto by jaws or frames, to prevent lateral motion. This beam is divided in the centre between the axles, one

end having a tooth, and the other a socket, cut of the epicycloid form, to keep the point of action at an equal distance from the centres of each axle. The axles are kept together by fastening the body by bolts to the beds resting upon each. Another method of construction is, to extend the beam from the hind axle, until the end of it rests upon the bed of the fore axle, while the beam from the fore axle reaches to a short distance only behind the central point of action. A bolt then passed through the centre of the hind frame, and the end of the fore frame, and equi-distant from the axles, forms the pivot or point of action between them. In this case, the waggon is fastened firmly to the hind bed only, and to the extremity of the hind beam, which rests on the fore bed, which is made to traverse, laterally, more easily by a small roller upon a curved strip of iron.

The friction-wheels are contained between upright stands, or supports, of cast or wrought iron; each wheel having one on each side connected at the top by a bolt and nuts, and having jaws at the bottom, wide enough to admit the axle in contact with the friction-wheel; each pair of friction-wheels is connected by iron bars passing through each arm of the jaws of the supports, and secured by nuts: between these bars the axle revolves, and the bars rising above the axle, receive the beam, and form the fore and hind beds to which the frames of the beam are securely nitted. To obviate the little friction which may arise from the centre of the friction-wheel being directly above the centre of the axle, it may be placed a little obliquely, and a small friction-roller used in one of the arms of the jaws, to destroy the additional friction there.

The axles have two shoulders at each end, one of which supports the waggon wheel, and is either firmly fixed to it, or only secured by a linch-pin, and the other revolves upon the friction-wheel.

These principles are not new, but the combination of them into a rail-way carriage is new, and entitles the inventor believes, that his invention be secured by patent. The peculiar application of friction-wheels is also new, and claimed as original.

WILLIAM HOWARD.

Fig. 1. Represents a perspective view of the whole carriage, with its friction-wheels attached.

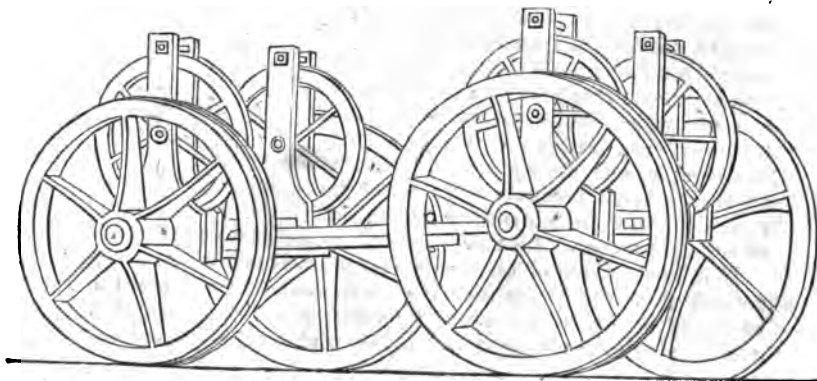
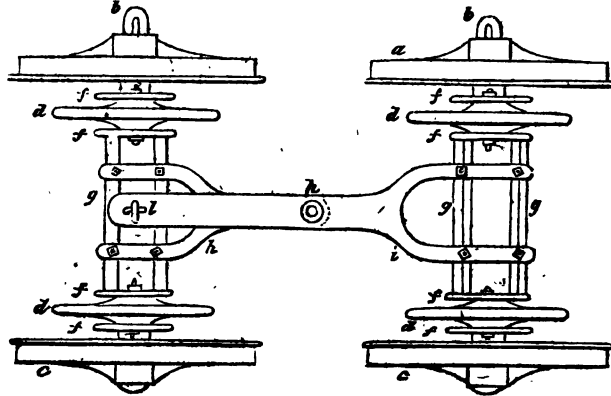


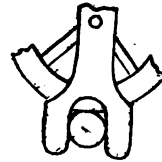
Fig. 2. Represents the plan of the waggon, showing particularly the manner in which the beds of the two axles are connected.—

Fig. 2.



a is the iron waggon wheel, made as usual, except that it is arranged so as to turn on the axle to which it is secured by the linch-pin *b*, or any other contrivance. *c* is a wheel fixed upon the axle as in the common rail-road carriage. *dd* the friction-wheels moving upon the axles *ee*, and supported by the supports *ff*. The whole of these parts are of wrought or cast-iron, and the frames are secured together by screws and nuts, so as to keep them solid, and as shown in the figure *g*, one of the bars connecting the two frames together, and secured in like manner. *h* and *i* are the two frames by which the two beds are connected by a bolt at the point *k*, equidistant from the centre of each axletree, the frame *i* of the hind bed is prolonged, and rests on part of the frame *h*, immediately over the fore axle, the motion of its end, laterally, being facilitated by a small roller at *l*.

Fig. 3. Represents the shape of the frames *ff*, permitting the axle to rest on the periphery of the friction-wheels. In the arrangement here drawn, it is proposed to fix, firmly, the body of the waggon on the hind bed and frame *l*, to move with it. Another method is, to attach each bed to the body by a bolt at *m* and *n*, round which the beds must be made to traverse. The frames are then to be connected at *o*, one having a tooth and the other a socket. These are to be cut of the epicycloid form, which will keep the point of action at an equal distance from each of the centres *m* and *n*.



If it be not found objectionable to place the body of the waggon entirely above the wheels, the two friction-wheels on one bed may be placed on a common axle. This arrangement will simplify the number of parts, and contribute to the steadiness of the motion.

IMPROVED MODE OF DRAWING AND CORKING SPARKLING LIQUORS.

By STEEN ANDERSON BILLE, of New York.

THIS invention consists in performing the operation of drawing any sparkling liquor, as malt liquor, or cider, from one or more vessels, and filling one or more other vessels with it, as also of closing it firmly in such one or more other vessels, by corks, plugs, or stoppers of any kind, the whole under an artificial *pressure*, by means of compressed air, corresponding with, or in some measure exceeding, the sparkling power of the liquor in question; thereby preserving unimpaired, such sparkling power of the liquor, as well as its clearness (both being the result of repose and pressure,) notwithstanding the drawing and corking of the same.

To effect this, an air chamber is constructed, sufficiently strong to retain the air, compressed to any degree required, and sufficiently spacious to allow the whole operation above stated, to be performed within its walls.

It having been fully ascertained, by the use of diving bells, that the lungs of man are not effected, in any manner injurious to health, by breathing air, for a limited time, under an artificial pressure of one or two atmospheres in addition to the common atmospheric pressure, there can, of course, be no reasonable objection to one or more persons, as the work may require, closing themselves up in an air chamber of the above description, similar in its operation on the human frame, to a diving bell, descending in the water to a depth producing a similar compression of the air within. The air in both vessels, viz. in the diving bell and in the air chamber for the drawing and corking of sparkling liquors, is maintained in its purity for animal breathing, by the application of an air-pump; and while the pressure in the diving bell is produced by, or depending upon, the depth to which the bell shall be sunk, the pressure in the air chamber for the drawing and corking of sparkling liquors will be produced by the air-pump, and will be depending upon a relieving valve, not admitting the pressure within to exceed the weight by which the valve shall have been previously regulated, with a view to the contemplated operation; or if a column of water be substituted for a valve, then the weight of such a column of water; which latter medium possesses the additional advantage of counteracting any little variation which change of temperature may occasion in the expansion of the air within, by either receding from, or filling up, the space of any vessel into which the end of the tube shall be immersed.

If the fermented liquor to be operated upon, be placed in an air chamber of this description, in *open vessels*, it is evident that the developement of carbonic acid, or rather the escape of it in the shape of gas, will, by the pressure of the compressed air, contained in the air chamber, be as effectually checked, to the extent of such pressure, as if the liquor were kept within corked bottles. On the contrary, as far as the chemical energy of the fermented liquor in forming carbonic acid, and emitting it in the shape of gas, exceeds

the pressure of the compressed air intended for its suppression, the fixed air will naturally escape; this, however, is so far from being a disadvantage, that it actually is a most desirable circumstance, affording the means of relieving the liquor from any excess of expansive force, which, otherwise, might endanger the vessels intended for its keeping. Thus the sparkling power of the liquor may be governed and controlled at pleasure, as well with a view to its safety in keeping, as its fitness for a beverage.

When the liquor shall have been kept a sufficient time under pressure in the air chamber, to have acquired the sparkling quality desired, either by fermentation, or by some other chemical process, it may be drawn off into bottles, and corked perfectly clear (leaving the sediment in the vat,) and perfectly sparkling, ready for immediate use, as though it had been kept all the while within bottles; provided such drawing and corking of the liquor be performed in the air chamber, that is to say, under the pressure to which the liquor till then shall have been subject. The best proof of this fact is, the flat appearance of any sparkling liquor while under pressure in the bottle, notwithstanding the motion given to the liquor by turning or upsetting the bottle in which it is contained. It may, therefore, in a similar manner, be handled without any loss whatever of its acquired qualities, in pouring it from one vessel into another, provided only as above stated, the pressure be preserved during the operation.

The fermented liquor to be operated upon, is introduced into the air chamber, by means of a cylinder, without the air chamber, placed horizontally, or nearly so, above the height of the vats within, intended for the reception of the liquor. This cylinder is furnished with four tubes and cocks, two communicating with the air chamber, viz. one on the top of the cylinder, communicating with the air in the air chamber, the other at the bottom of the cylinder, communicating with the spout leading to the vat within, intended for the reception of the liquor; and two communicating with the atmosphere, the one at top with the air, the other at bottom with the liquor to be introduced; thus, by alternately shutting and opening the respective cocks, the liquor may successively be supplied to the cylinder, and emptied into the vats in the air chamber.

For the admission of the person to perform the operations of drawing and corking the liquor, a manhole is formed in the top of the air chamber, having a lid inside, which closes hermetically, by the pressure of the air within. A moveable cylinder, closed at top, covers the person who is to enter; this cylinder is screwed air-tight to the rim or flanch of the manhole. On opening a communication between the air chamber and the cylinder by means of a cock, the state of the air in both will be equalized, and the entrance through the manhole thereby rendered perfectly free. On leaving the chamber the same way, the manhole is shut, and a communication opened between the cylinder and the atmospheric air, which will relieve the cylinder from the compressed air within, and thus allow the cylinder to be removed to let out the person shut up in it.

The bottles are introduced into the air chamber, and again delivered out from the air chamber, through one or more boxes attached to the chamber, having a door at each end; the one opening into the air chamber, and the other communicating with the atmosphere. The bottles are placed upon a moveable shelf, and thus introduced into the box; closing the door and opening the cock of a tube connected with the box and air chamber, the air in both will be equalized, and thus the entrance into the air chamber rendered free. By reversing the operation, the shelf with its bottles may, in a similar manner, be let out. If two boxes be made use of, some saving may be made in the expenditure of compressed air at this operation, by equalizing the air in both the boxes, the one for letting in, the other for letting out, before any new communication is opened, either with the air chamber or the atmosphere, as the case may be.

The application of four boxes will be still better, with a view to despatch in receiving, filling, corking, and again delivering out the bottles, agreeably to a new plan, invented by the undersigned for performing these operations. If the liquor is to be drawn off in vessels larger than bottles, as barrels or casks, such vessels, being necessarily perfectly tight and strong, are placed near the air chamber, from which two pipes are made to communicate with the top of the vessel, by two corresponding holes and sockets, or flanges, in the vessel; the one for equalizing the air in both, the other for drawing the liquor from the vats in the air chamber: thus, by turning the respective cocks, the above operation may be performed at pleasure.

To prevent any mustiness forming on the top of the liquor in the vats in the air chamber, in consideration of a more extended surface of the liquor being in contact with the air in this way, than when closed up in bottles, but still more so with a view to the air in the air chamber being constantly renewed for the sake of respiration, the surface of the liquor ought to be covered with a floating lid, or top piece, having only a trifling space open round its edge to prevent it from sticking to the vat, and this little space may still further be closed up by some liquid, lighter than the liquor in the vat, as water, spirit, or sweet oil, not easily affected by the air, not affecting itself the liquor.

With a view to the safety of the person entering the air chamber, a pliable tube may be attached to the opening inside, through which the air is forced into the air chamber by the air-pump, necessarily at work when any person is engaged in the chamber, which tube, when taken up by such a person, or placed near to him only, will infallibly secure to him a current of air, abundantly sufficient for respiration; besides which, the whole air in the chamber may, occasionally, be renewed for the same purpose as above stated, and even before entering the chamber, the actual state of the air may be fully ascertained by cocks, communicating with the interior, and, if required, a general purification then be effected by the air-pump. If an additional air-pump be applied for the emission of air from

the lower part of the chamber, the carbonic acid gas being the heaviest, while, by the other pump, air is forced into the upper part at the same ratio; the connection of both with a common fly wheel, will counterbalance the power required for the latter operation, leaving only the friction to be overcome, which will facilitate the purification of the air within to such a degree as to admit of keeping it constantly as pure as the air without, whatever the size of the chamber may be, by the mere overcoming the friction of the air-pumps thus applied. Light is best admitted by reflection from without, to avoid any inconvenience from the direct application of lamps within.

To shorten the time necessary for any person to stay in the air chamber, it is desirable that such improvements in the drawing and corking of liquors should be adopted, as will facilitate this operation; such improvements, however, forming no part of the present invention, it is unnecessary here to enlarge upon the subject any further.

With regard to the construction of the air chamber, strength and tightness constitute the qualities indispensably required; these may be obtained in different ways, but it is presumed to be the cheapest plan to give to the air chamber a circular shape, by which the two sides are made to form, as it were, one cylinder within another; kept together by square frames of beams, placed vertically at suitable distances, radiating as it were from a common centre, and enclosing at the same time both top and bottom, while the whole is lined with planks, forming an entire box, to be covered internally, with some substance fit to render the chamber air-tight, as zinc, or lead in sheets. If the width, or height, be too great for the frames to sustain the pressure from within, bars of iron may be applied in support of the middle of the beams; by thus connecting the cross beams of the opposite sides, as well as those of the top and bottom, which will not materially interfere with the application of the space within, to the purposes intended.

When the air chamber shall be duly protected against the variations of the temperature of the external air, the temperature of the air within may be kept pretty uniform, or at any degree required, by suffering the air, in entering the chamber, to pass through a cooling, or a heating vessel, as the case may require.

Although several advantages, as above stated, will result from the application of an air chamber, in keeping quantities of liquor under pressure for the purpose of rendering them clear and sparkling, the subscriber does not claim such advantages generally, as his invention; but he confines himself, in his claim of invention, to the mere drawing and corking of sparkling liquors *under pressure*, by means of an air chamber, containing air compressed to any degree required, whereby the clearness and sparkling quality of the liquor, previously acquired, either in the air chamber or elsewhere, will be preserved unimpaired, notwithstanding the drawing and corking of the same.

STEEN A. BILLE.

LIST OF PATENTS RECENTLY TAKEN OUT.**PATENT METHOD OF MAKING SAILS.**

By **SAMUEL BROOKING**, R. N. of Plymouth.—Enrolled 4th March, 1829.

THIS invention is applicable to the manufacture of sails for ship and other vessels, and consists in arranging the pieces of canvas, lengthwise, in the direction of the greatest stress on the sail; so that the seams of the canvas shall be in the direction of the pull, by which the sails are made tight. This direction, of course, varies with the shape of the sail. In square sails the seams extend from the middle, which is made very strong by a vertical cord to which it is firmly secured in a sloping direction towards the lower corners, where the tightening ropes are attached; the top of the sail being secured all along the upper yard, the strain is sufficiently equalized to give strength to that part. In the triangular sails, the seams are made to extend in an inclined direction from the side opposite towards the corner by which the sail is made tight.

PATENT BLOWING APPARATUS.

By **J. B. NEILSON**, of Glasgow.—Enrolled 11th March, 1829.

THIS invention is designated an improved application of air, to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus is required. The patentee does not claim the merit of novelty in the mode of "raising the wind" to blow a fire, but proposes that the air supplied by bellows, or any other contrivance, shall, before it enters the fire, pass through an air-vessel heated to a very high temperature, a red heat if possible; by which means a current of hot air will be thrown on to the fire, instead of the cold current usually employed. It is recommended that the air-vessel be surrounded with some non-conducting substance, and imbedded in brick-work or masonry. The patentee does not confine the hot air-vessel to any precise dimension, but he recommends that its capacity should be equal to about 1200 cubic inches, when employed for a smith's forge, and for a cupola or blast furnace about 10,000 cubic inches. Whether the increased temperature of the fire thus blown will produce advantages equivalent to the expense of constructing the air vessel, and keeping it at the requisite heat, seems very problematical. There are, however, about some fire-places many sources of waste of heat; and if arrangements can be made to render the heat which is wasted available, by raising the temperature of the oxygen by which the combustion is effected, the plan might be attended with beneficial results.

NEW PATENT MACHINERY FOR MAKING BRICKS.

By **WILLIAM MENCKE**, of Park-place, Peckham, Surrey.—Enrolled 11th Feb. 1829.

Mr. Mencke's patent is for certain improvements in preparing materials for, and in making bricks. His improved method of preparing the materials consists in adding to the clay or brick-earth, after it has been mixed with chalk, a quantity of sulphuric acid, for the purpose of causing the materials to unite, and to dry more quickly. His method of manufacturing the bricks consists in plac-

ing the brick earth, when properly prepared, and mixed with chalk, sulphuric acid, and the other materials usually employed, on a frame subdivided into compartments the size of the intended bricks, which is placed on the lower stage of a compound press, consisting of a frame and stages similar to the usual packing presses: the upper stage is attached to a powerful screw, with a fly-wheel, and the lower stage to the piston-rod of a hydraulic press. The lower stage being thus loaded, is raised by hydraulic pressure to an appropriate elevation, when blocks to fit into the divisions of the brick-frame attached to the upper stage of the press are brought down upon the brick earth by the power of the fly and screw. The pressure is then removed from the bricks, by permitting a portion of the water to escape from the press, and the bricks are carried to an arch-roofed building, furnished with a fire-place and flue, and properly ventilated, to accelerate their drying. The process is completed by burning them in a building precisely similar to that in which they are dried.

MISCELLANEOUS INTELLIGENCE.

INCREASE OF BULK IN CAST-IRON BY SUCCESSIVE HEATINGS.—In the course of the experiments made by M. Prinsep on high temperatures, he discovered the very remarkable fact, that *cast-iron acquires a permanent increase of bulk by each successive heating.*—This point is determined by measuring the cubic extent of an iron retort, as ascertained by the weight of pure mercury which it contained at the temperature of 80°. The actual contents were as follows:—

Before the first experiment	9·13 cubic inches.
After the first fire	9·64
After three fires	10·16

But what is more remarkable still, *the augmentation of the bulk of the retort exceeds the dilation due to the temperature to which it was exposed.* For as iron expands 0·0105 by 180° of Fahrenheit, the increase of bulk upon 10 cubic inches should be $0·0105 \times 3 = 0·315$ at 1800° of Fahrenheit, or even the melting heat of silver. Hence it is to be concluded that the dilatation of iron is not equable, a result formerly obtained by Messrs. Dulong and Petit.—*Edin. Jour. of Science.*

MEASUREMENT OF HIGH TEMPERATURES.—M. Pouillet has lately read to the French Academy of Sciences a memoir on the measurement of high temperatures, which, he considers, give results perfectly accurate. The means adopted by M. Pouillet bear some analogy to all those which are founded on the expansion of the air, and more especially with that used in the East Indies by M. Prinsep, Director of the Mint at Benares, published in the first number of the *Philosophical Transactions* of 1828. M. Pouillet's apparatus was finished, he avers, before he was acquainted with the labours of M. Prinsep. The following are some of the results given by M. Pouillet. The temperature of dull and red heat, scarcely perceptible from 850° to 950°. The temperature of bright red, 1004°.

Silver melting, 1677°.

Melting of an alloy of 1 part gold to 3 of silver, 1803°.

The temperature of the fusion of pure gold, 2096°.

The average results found by M. Prinsep are as follows:—

Full red heat	1200° Fahrenheit.
Orange heat	1650
Silver melting	1830
Silver, with one-seventh gold	1920
Silver, with one-tenth gold	2050

Mr. Wedgwood made the melting point of silver so high as 4717°, and Mr. Daniell 2233°.—*London Magazine.*

CHLORINE.—It is said that the most beneficial effects have been produced in pulmonary complaints by injections of chlorine. A physician in Paris has invented an instrument for the purpose.

LITHOGRAPHY.—A new lithographic process has been announced at Paris, which, besides other advantages, is said to be much cheaper, and much more rapidly performed, than any hitherto known.

MURIATE OF LIME.—The use of a solution of muriate of lime has been recently adopted with good success in the south of France, in the growth of Indian corn and other farinaceous vegetables. Two patches of corn were planted in a similar soil, one of which was watered regularly with the muriate of lime, and the other treated in the ordinary mode. The vegetation of the corn to which the muriate was applied was much more rapid than that of the other, and the produce was finer in quality and one-sixth greater in quantity.

LONGEVITY.—Barbarini, the singer, who was once a great favourite with the Russian Court, is said to be still living, at the age of 104 years, at Veronege, where he keeps an inn. He walks four or five miles daily, and frequently amuses his guests with playing on the guitar.

NEW CANNONS AND ROCKETS.—An engineer of St. Petersburg has invented a new kind of cannon for the war with Turkey, which will, it is said, prove a very formidable instrument. In size and weight it is equal to the ordinary sixty-four pounder; but the bore is calculated for a very small ball, which will range more than twice the distance of the shot now used. Russian agents are at present in this country, and in the Netherlands, superintending the casting of cannon on this principle. The same engineer has also invented a new rocket, which is reported to be much more destructive than the Congreve rocket.

SULPHUR A SECURITY AGAINST MEASLES.—The following account of the effects of sulphur in affording security against the infection of measles has been lately published by the Medical Society of Tours:—"In a family of four children, two took the flowers of sulphur, night and morning, and were entirely preserved from the contagious influence of the disease, although they continued to live in the same atmosphere, and communicated freely with the other children who had the disease. Two of five adults, who lived in the same house, contracted the measles; one had before had the disease!

They had employed no precautionary means. In another family one child had measles; three other children were not separated from the patient; they took, night and morning, sulphur mixed in sugar, and escaped the disease. The dose of the sulphur should be from two to six or eight grains, according to the age. In another case, an infant took the sulphur as soon as the disease had clearly manifested itself on his brother. In eight days, however, the measles appeared, but the malady ran so favourable a course, that it was probable the preservative effects of the remedy had some influence. Four other children were treated in a similar manner; they were designedly exposed to the contagion, but entirely escaped." Sulphur, being an aperient and sudorific, given at the time of sickening, and continued during the progress of measles, is very likely to render the disease mild, and to protect the lungs against the serious mischief which, in scrofulous subjects, frequently takes place during measles and hooping-cough, and to prevent secondary fever.—*Gazette of Health*, No. 160.

THE NOPAL, or COCHINEAL PLANT.—Mr. Thompson, in his work entitled "Official Visit to Guatemala," gives the following account of the plant. "The nopal is a plant consisting of little stems, but expanding itself into wide thick leaves, more or less prickly according to its different kind: one or two of these leaves being set as one plant, at the distance of two or three feet square from each other, are inoculated with the cochineal, which, I scarcely need say, is an insect: it is the same as if you would take the blight off an apple or other common tree, and rub a small portion of it on another tree free from the contagion, when the consequence would be, that the tree so inoculated would become covered with the blight: a small quantity of the insects in question is sufficient for each plant, which in proportion as it increases its leaves, is sure to be covered with the costly parasite. When the plant is perfectly saturated, the cochineal is scraped off with great care. The plants are not very valuable for the first year, but they may be estimated as yielding after the second year, from a dollar and a half profit on each plant."

LIST OF NEW PATENTS SEALED.

WOOLLEN CLOTH.—To George Haden, of Trowbridge, Wilts, for improvements in machinery for dressing cloths. 2d March. Six months for enrolment.

WOOLLEN CLOTH.—To William Storey and Samuel Hirst, of Batley, Yorkshire, for the discovery of certain materials suited for scouring, milling, fulling, &c. cloths, and other fabrics. 10th March. Six months.

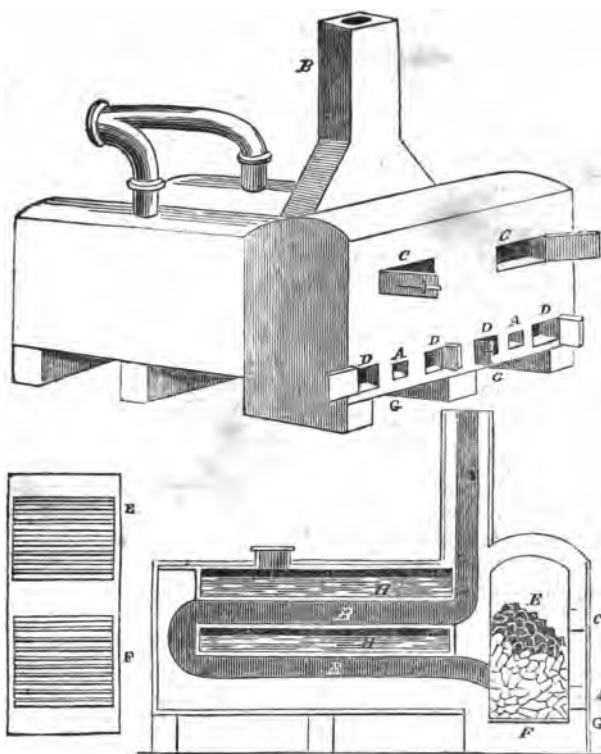
BOOTS AND SHOES.—To Richard Hall, of Plymouth, for having invented a composition applicable to certain fabrics and substances, from which may be manufactured boots, shoes, and various other articles. 10th March. Six months.

PRINTING.—To J. W. Wayte, of Drury-lane, for improvements in printing machinery. 19th March. Six months.

BUTTONS.—To William Church, of Birmingham, for improvements in buttons, and in the machinery for manufacturing the same. 26th March. Six months.

TO CORRESPONDENTS.

The drawing square of J. W——n, though new to him, is of many years standing.—A "Novice," must operate across the grain, he will then get on easily.—M. H. is too metaphorical for the Register.—Mr. N——'s drawings lie at our publishers for delivery.



AMERICAN PATENT FURNACE FOR GENERATING STEAM BY ANTHRACITE COAL, AND FOR VARIOUS MANUFACTURES REQUIRING INTENSE HEAT.

By BENJAMIN B. HOWELL, Philadelphia, Oct. 14th, 1829.

THAT class of inventions may be regarded as of the utmost value, which enable us to turn to profitable account those great *natural* productions of a country, which have heretofore been considered as unavailable. It is therefore with peculiar satisfaction, that we have to announce to our readers a succession of improvements made by our transatlantic brethren, in the application and use of *anthracite* or stone coal; a mineral, with which this country is most amply furnished, and usually found deposited, in contiguous strata to the most valuable of the metals.

The reduction of iron ore into malleable metal is now effected by stone coal alone, in a manner superior to our tedious and unscientific process with the bituminous coal.

The making of malleable iron direct from the ore, by a single process, without suffering it to cool, has long been with us a favourite theory, and in broaching our ideas on the subject to various persons connected with the iron trade, we have almost uniformly met with little else but derision. Practical smelters, in America, do not however labour under such a grievous load of prejudice as they do here; their theory and practice, are aided by a fine spirit of enterprise, and more improvements are effected in one year, than we produce in ten.

The account of Mr. Howell's new process of making iron, we received through a private channel; the *Franklin Journals*, recently arrived, however contain the specification of that patent, and some other information on the subject, of great interest, which we proceed to give, commencing with Mr. Howell's method of applying stone coal to the production of steam.

THE improvement claimed, consists in the form and principle of the interior of the furnace, and in its being a separate structure from the boiler or other body to be heated, by the means of which the heat is generated without bringing the fuel in contact with the boiler or other body; and in the application of an artificial blast upon anthracite coal, increasing, in a great degree, the intensity of the heat, and giving it the necessary direction through the communicating flues of the furnace, upon the bodies to be heated.

The drawings exhibit a front elevation, a ground plan, an a section; all upon a scale of six feet to an inch.

The exterior shape and proportions may be varied at pleasure, provided the principle of generating and applying the heat, be retained.

With a furnace of this construction, and a moderate blast, the flame and the heat may be carried to almost any required extent under the boiler of a steam engine or other body, using anthracite coal as fuel. The blast may be obtained by attaching a small pair of tub, or other bellows to the engine, and the machinery may be put in motion by using, in the first place, a small quantity of wood. Power enough being thus obtained, to start the bellows, no more wood will be required until after the fire has been suffered to go down and is to be again renewed.

The coal should always be kept, while in full operation, at about the line E, or, at least, so much above the flue B, that it may become perfectly ignited before it sinks to that level. Attention to this is important in preserving a uniform temperature.

The additional power required to propel the bellows, beyond that necessary for the ordinary work to be performed by the engine, will be very small, it is believed not more than a single horse to an engine of what is called forty horse power, or about two and one-half per cent.; but should it exceed that estimate in a triple proportion, and experience justifies the conclusion that it will not, the economy

of room on board of steam boats, where room is so valuable, with other advantages hereafter mentioned, and the saving, in all places, of expense in fuel, will much more than compensate this disadvantage.

But in addition to the economy effected by the introduction into general use for this object, of a fuel existing in inexhaustible quantities in our country, to the exclusion, in many situations at least, of one daily becoming more scarce and costly, a further and important saving will result in the construction of boilers adapted to this furnace; nearly all the space now occupied by the wood, that is, the furnace part of the boiler, may be dispensed with, and in its place be substituted a narrow flue for the passage of the heat under that part of the boiler containing the water. The part that may be dispensed with, forms an expensive part of the whole, while the furnace in which the heat is to be generated, being of a less expensive material will be much less costly. The great objection to the use of anthracite coal in generating steam, arising from the necessity heretofore supposed to exist, of bringing the fuel in actual contact with, or near approach to, the boiler along its entire surface, is, by this plan, entirely obviated, as the coal here is never in contact with the iron, which, of course, will be much more durable than if constantly acted upon by the direct heat of the fuel.

The principle in the construction of furnaces, and the generation and application of heat by means of anthracite coal and an artificial blast, may be applied with equal advantage to the manufacture of glass, earthenware, pottery, the burning of brick, and all manufactures admitting a like application of heat.

B. B. HOWELL.

Notes and references for the improved Furnace for using Anthracite Coal in generating Steam, and for various manufactures requiring intense heat.

The drawings, Figs. 1, 2, and 3, represent an elevation, a vertical section, and a ground plan, all upon a scale of six feet to an inch; and the same letters refer to the corresponding parts of each.

A. A. Tuyeres for introducing blast.

B. B. Line of flue for the passage of flame and heat under the boiler, or other vessel, or body, to be heated.

C. C. Charging-doors for coal.

D. D. Cleaning-out doors, occasionally used as draught doors.

E. Line of upper surface of coal.

F. F. Grate bars. Where it is inconvenient to use these, the bottom of the furnace may be closed, as the blast will sufficiently ignite the coal; and the wood first used may be ignited by throwing open the cleaning-out doors at D. D.

G. G. Openings to promote draught, before applying blast. These may be omitted, in like manner with the bars.

The furnace should be lined with fire brick, and cased with cast iron plates, secured by strong bolts, screws, and keys; and between these, common brick may be used. If a thin packing, or lining of sand, be also interposed, it will be found useful in preventing injury from expansion.

B. B. HOWELL.

Remarks by the Editor.—But a very few years have elapsed since the general impression in Philadelphia, and other places where attempts had been made to use anthracite as fuel, was, that we might as well attempt to burn bricks and stones; yet it is now known to require less management than any other fuel, and those only experience difficulty, who take too much trouble to succeed. After the coals are once placed in our grates, and ignited, their motto seems to be "*Laissez nous faire*," and observing this, every thing proceeds with the utmost facility. When it was admitted, not merely to answer well, but absolutely to be the best fire for our parlours, it was still thought by many, that it would never descend into the kitchen, as it was, from its *very nature*, inapplicable to culinary purposes; but here again it was destined to obtain a triumph. The fireman of the steam engine, and the iron master, however, yet remained unconvinced: these averred that they had given it a fair and perfect trial, and that it would never do; there was still something in its *very nature*, which, in their occupations, forbade its use. You might as well have attempted to convince them that it was fit to be made into candles, as that it might be employed for their purposes, if their furnaces were suitably constructed, and the fuel properly managed. It appears likely, however, that it will soon assert its claims to superior excellence, in these applications also, and triumph over the prejudices of the managers of furnaces, as it has over those of the householder, the cook, and the blacksmith.

That many abortive attempts would precede its successful use, was to have been expected, as it differs in so many particulars from the fuel we had been in the habit of using; but it was evident that an intense heat was given out in its combustion, and if we could only transfer this to the water in our boilers, we must convert it into steam; and in like manner, it must reduce the ore, could the heat, and the carbon, be made to operate upon it. That there was nothing in the nature of things to forbid this, we have ever believed, and are now fully persuaded, that, in all cases, excepting where the action of a large volume of flame is necessary, this fuel may be advantageously employed.

When the application was made for the foregoing patent, some of its leading features appeared to us such as to merit particular attention; the more so in consequence of some circumstances mentioned by Mr. Howell, in a letter which accompanied his other papers; in reply to a communication addressed to him, on the subject of his furnace, he says, "I am not surprised that my statement of the effect

produced by the flame of anthracite, has somewhat astonished you. That a fuel, which has, heretofore, been supposed incapable of producing *any* flame, should in truth be so powerful in this respect, is really wonderful. But it has, in reality, been hitherto but little understood, and too much has been taken for granted in relation to it. With regard to this particular property, the error has, I think, been caused by the practice of looking at the upper surface of the coal, the flame from which does not, until the coal is fully ignited, yield much heat, and is liable to great variation of temperature, from the necessity of placing there new supplies of fuel, which, for a long time, gives no heat whatever. In both my furnaces, you will remark, that the heat is first generated in *close* vessels, and thence taken from that part where the heat is uniform, and most intense; under this arrangement, the effect is, indeed, really astonishing. The length of one of the furnaces in which my experiments were made, was about six feet, and the height of the chimney, ten; or the length of the flue, horizontal and perpendicular, fifteen. The quantity of coal did not, I think, exceed a bushel, certainly not a bushel and a half; and yet the bricks at the top of the chimney were *red hot*; and the flame rose full six feet above the top, strong and vigorous.

"I anticipate that the idea of blowing a steam boat fire, with bellows, will be ridiculed; but this, or something like it, will, I am persuaded, be adopted. Perhaps I go too far in thinking that it may be applied to glass-houses, furnaces, &c., but time will determine."

We think Mr. Howell's remarks highly interesting, and hope soon to hear from him the results of his further important investigations and experiments. For the fact of a flame of six feet in height, from anthracite, we were not prepared; nor are we now of opinion that the flame actually extended from the fire to the top of the chimney, but believe that the flue was filled with heated air, consisting of nitrogen, carbonic acid, and carbonic oxide, and that the latter inflamed on its coming in contact with the oxygen of the atmosphere.

This remark has little to do with the practical utility of Mr. Howell's furnace, and is intended only to apply to the theory of the production of the flame, which issued from the chimney, and which, we apprehend, was not twenty-one feet in length.—*Journal of the Franklin Institute.*

AMERICAN PATENT HILL-SIDE PLOUGH.

By NORMAN STAPLES, Penn's Store, Patrick County, Virginia, Nov. 1, 1828.

THE object to be attained by the use of this plough, is the turning of the sward down hill, in horizontal ploughing, in both directions. To accomplish this, there are two shares and mould-boards, placed

on the opposite sides of the beam; when one of these is in the ground, the other is, of course, turned up into the air. On arriving at the end of a furrow, the plough is inverted; that which was the upper share, being now turned into the ground.

The plough handles turn upon a pin at the end, by which they are affixed to the beams of the plough, so that when the instrument is inverted the handles may be made to assume their proper position. They are secured by a spring, to either end of a piece of timber in the form of a segment of a circle, attached to the end of the beam for that purpose. In the drawing which accompanies the description, each handle is represented as forked, or split at the end, and the divided part bent in opposite directions, so that it may be held conveniently either way. The patentee says, "I claim as my invention the use of one more share than is commonly used, and the spring, the circular pieces of wood in the beam, or, in fact, the particular construction of the whole, in order to turn the sward down hill."

There is in the Patent office a model of a plough, deposited there in January, 1815, by John Brown, which is perfectly similar to the foregoing in all its essential features. It does not appear to have been patented, probably, because there are others of still older date, which are constructed in the same way.

A double plough, intended to answer the purpose of the foregoing was patented by John Cromwell, of Maryland, in 1816: in this plough there are two mould boards and shares of the ordinary construction, turned back to back, and a moveable beam, to which the horse is attached, turns upon a pin on the centre of the fixed beam which unites them. The horse and moveable beam turn round at the end of every furrough, they being confined together, temporarily, by proper catches; the right and left handled ploughs are thus, alternately, brought into action.—*Ibid.*

AMERICAN PATENT THRASHING-MACHINE.

By SAM. S. ALLEN, Skeneateles, Onondago county, New York, Nov. 1, 1828.

A CYLINDER, with teeth, is made to turn horizontally; beneath this is a fixed concave segment of a cylinder, forming about one-sixth of a circle, which is also set with teeth, which are to separate the grain from the ear.

A feeding apron, moved by rollers, in the usual way, carries the grain forward between the cylinder and the concave segment.

The concave segment is made of separate strips of timber, which are capable of being placed at different distances from each other, by the aid of wedges, screws, or other contrivance. The teeth are not to be inserted vertically, either in the cylinder, or segment; and particular angles of inclination are given, such as the patentee

thinks the most advantageous; their distances apart are also designated, and the direction of the lines in which they are to be set.

The specification ends thus: "The above form and size of the various parts of the machine, are convenient in their construction, but may be varied at the pleasure of the builder; especially where great water power can be easily obtained, a larger machine will, of course, be more useful and expeditious in its operations.

"I claim as an important improvement, the arrangement and inclination of the teeth, in the bed, or curb, of the machine, by which arrangement the grain is readily introduced into the machine, and a great saving of power is thereby effected, the straw is less broken, and the operation of thrashing is performed in a much neater and more cleanly manner. Also in the construction of the bed in separate pieces, with keys and mortises, screws, wedges, or otherwise, whereby each alternate piece may be moved in an opposite direction, and the operator is thereby enabled to increase, or lessen, the space between the teeth in the bed and those on the cylinder, at pleasure, and adapt it to the thrashing of various kinds of grain, according to the quality, or the damp or dry state thereof."—*Ibid.*

AMERICAN PATENT FOR WASHING, FILLING, AND CORKING BOTTLES.

By S. A. BILLE; New York, Nov. 8, 1828.

THE specification of this patent occupies twenty-one written pages, and is accompanied by three drawings of the machinery to be used for cleaning, filling, and corking. In the operation of cleaning, the bottles are to be placed upon shelves, in an inverted position, their necks passing through holes made for that purpose. Under the neck of each bottle there is a tube standing vertically, its upper end being perforated, so as to throw out numerous jets of water: the lower ends of these tubes are connected to a common reservoir of water, which may be forced from it under a sufficient head, or by a forcing-pump. There is an apparatus for lowering the shelves, so that the tubes may pass into the bottles, and reach nearly to their bottoms. When so situated, the water is let on, and rushes into the bottles, which, during the operation, may be raised and lowered by the motion of the shelves.

In the filling-machine the liquor to be bottled is contained in a proper box, or vessel, from each side of which project rows of tubes, bent like a syphon, with their open ends downwards. The bottles to be filled are placed in rows, upon shelves, under the tubes; these shelves are to be raised by proper machinery, so that the syphons may reach nearly to the bottom of each. The bottles are to be of the kind blown in moulds, that they may be all of one height, that when the valve is open, which allows the liquor to flow into them, it may rise in each to the proper height for corking, at the same

instant, the syphons causing the liquor to stand, in them, at the same level with that in the box.

The corking-machine is intended as an improvement upon that of Masterman, patented in England in 1825, (of which an account is given in this Journal.) The corks are forced by pistons through conical funnels, under which are placed the bottles. Cylindrical corks are preferred, as they expand in the neck-of the bottle, and fit it more perfectly at their lower ends, than others. Three-fourths of the specification are occupied by a description of this machine, which is too complex to be understood without drawings; it is not, we apprehend, of sufficient general interest to justify the assigning to it the space which it would require.

To insert the words of the claim, would be to repeat much of what we have said above; it is therefore considered unnecessary.—*Ibid.*

MARINE SELF-ACTING HYDRAULIC-ENGINE.

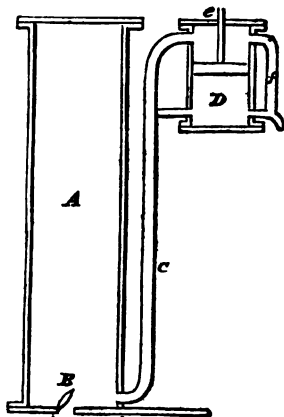
By Dr. UDNY, of Arbour Terrace, Commercial road.

FIG. 1.

A. Cylinder placed vertically in the vessel shut at top, B. Opening to the sea, with a self-working valve opening into the cylinder.

C. Pipe to the working cylinder, having branches to its top and bottom. D. The working cylinder, *e*, its piston and rod. *f*, pipes to the air—the pipes of the working cylinder have valves wrought by the beam, &c.

The acting is as follows.—When the vessel pitches, the sea rushes in by B, condensing the air in the upper part of the vessel A; and when she rises, the valve of B, shuts down, so that the water cannot escape, and it is constantly forced up, either by the direct action of the sea, or the re-action of the condensed air by the pipe C, into one end or the other of the cylinder D, according as the branches are opened to above and below the piston *e*, and alternately the pipes *f*, being opened from the ends of D, all resistance is removed from the side of the piston opposite to that on which the water is acting. The valves of the pipes C, and *f*, will be wrought by the beam. A second sea-working pump may be attached to the eduction pipes *f*, so as to remove the resistance more perfectly. Thus the engine will be wrought by the vessel's motion, and without any expenditure. The cylinder D, should be placed as high, and the pipe *f*, be conducted as far down as possible, and it ought to have a valve on it to prevent the return of the water.

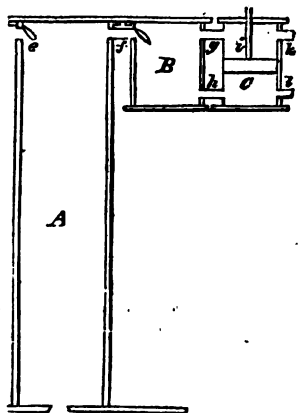


MARINE SELF-ACTING PNEUMATIC-ENGINE.

By DR. UDNV, of Arbour Terrace, Commercial Road.

FIG 2.

A. The cylinder for the sea to act in through D. e. Opening to the air with self-working valve. B. Air-vessel. f. Pipe to do from cylinder A. C. Working cylinder. i. Piston and rod. g, and h. Pipes from air-vessel to both ends of working cylinder. k, and l. Pipes to the air from working cylinder, &c.



In this engine, as the vessel pitches, the sea flows freely out and in through D, and alternately forces the air through f, into the vessel B, from which it cannot get back, in consequence of the valve opening into B, or allows it to rush in by e, to supply the vacuum formed by the subsiding of the water in A. In B—Then the air is constantly condensed, in proportion to the height of the sea, which acts as a force-pump, and it is alternately permitted to flow into C, above and below the piston i, the pipe k, to the air being opened at the same time as h, is from B, and l, and g, being opened also simultaneously. k, and l, may be attached to another sea-working pump, so as to produce a vacuum alternately on each side of i. This engine takes little space, and as A, may be made of wood or other cheap substance, it will cost little—and a steam-vessel might have both engines in her, this to be used when there was any sea running, as is most commonly the case.

PATENT STEAM-ENGINE BOILER.

By DR. UDNV, of Arbour Terrace, Commercial Road.

THIS invention consists of an addition to ordinary boilers, by which the ill effects to which they are liable are prevented, when used at sea, or in a carriage, from the motion; and which will render all boilers more safe to which it is applied, and less likely to be essentially deranged. It consists of a pipe, or tubes, running from the upper part of one end, or side of the boiler, over its top, or along it laterally, to the opposite point, at or about the same height; through this pipe or ducts, the steam, if from any cause compressed in one part of the boiler, will find its way to another, so as to render the action in all parts of the cavity regular and uniform; and to prevent a jet of the fluid from being thrown off by the safety-valve, from the agitation of the water in the boiler, in consequence of the pitching, or rolling, or lurching of a vessel or carriage, by which great waste is occasioned. These pipes may be

made of copper, or other material thought best, and should be so much weaker than the boiler itself, that in the event of too great a pressure, they may burst first, and thus prevent the destruction of that essential part, and the mischief likely to arise from it; they are also to have a cock at each end, so that, should one of them give way, on these cocks at its extremities being closed, the steam will be confined in the boiler, which will be as good as ever; and by keeping one or more of the pipes as a reserve, from which the steam is excluded, in the first instance, and into which it will be admitted, should an accident occur to the first set, the boiler will have all the advantages it possessed at first.

**AMERICAN PATENT FOR IMPROVEMENT IN THE
MODE OF MAKING OR FORMING HAT BODIES.**

By H. F. WEST and A. H. STEVENS, Richland county, New York, Oct. 29,
1928.

First. A complete carding machine, with the exception of the roller and doffer, the doffer being covered with filleting cards, which brings the wool from the machine in a continued web.

Secondly. This web alights upon a table, constructed for its reception, about five feet in length, and three in width, with rollers in each end, over which an apron passes, the rollers moving by a band, or by cog wheels, attached to the machine above described, with sufficient velocity to receive the web free from wrinkles, and without stretching it in the least, carrying it from the place where it first strikes, or alights, upon the apron, to the other end, perfectly smooth.

Thirdly. From this the web is taken, by a hat former, (this being the only part of the machinery herein described, which the petitioners claim as their invention, together with the manner of using the hat former, and the right of forming hats on the apron and table,) the hat former consisting of a board from three feet to four feet and four inches in length, and from sixteen inches to thirty-two inches in width at the centre, according to the size of the hat to be formed; being tapered from the centre to each end, leaving the ends from five to twelve inches, which are made round, the board forming, from its dimensions or shape, two hat bodies, one at each end.

Fourthly. The web is wound upon this board, by laying the board, or former, upon the table, and rolling it onward, the apron advancing in the mean time; (the board may be previously covered with some kind of thin cloth, from the centre to the ends, which causes the web to cleave to the hat former, the cloth consisting of two pieces, one at each end;) the web diagonally covering the former on all parts, smoothly as the workman wishes, who turns the former, standing at the other end of the table.

Fifthly. After the hat bodies are thus wound upon this board, or former, they are cut, or torn, in the centre, and taken from each

end; the cloth may come from the former at the same time, and with the hat bodies, then be taken from them, and placed again around the hat former.

HENRY F. WEST.

ANDREW H. STEVENS.

**AMERICAN PATENT FOR MAKING PAPER OF THE
HUSKS OF INDIAN CORN.**

By A. and N. A. SPRAGUE, Fredonia, Chataque county, New York, Oct. 31.

"To one hundred and twenty-eight gallons of water, put in ten quarts of good lime, or about six pound of good alkalies, and place therein about one hundred and ten pounds of clean corn husks, or flag leaves; let the water be moderately heated, over a moderate fire, for two hours, when they will be ready for the engine, there to be worked, and managed in every respect as rags are, for the making of paper."

**AMERICAN PATENT FOR IMPROVING THE SHAPE,
CARRIAGE, ACTION, AND POWER OF HORSES, BY
A NEW METHOD OF FEEDING THEM.**

By A. CARMAN, Hyde Park, Dutchess county, New York, Nov. 27, 1828.

"The peculiarity of his method is, to feed horses and colts by placing the food, whether it be hay or grain, as high above their heads as can be done, allowing the animal to eat with ease to himself."

The method of feeding on the ground, or from box mangers very little elevated, generally not higher than the breast of the horse, is considered as injurious, as colts, from the period of weaning, are, during the time they are eating, which is supposed to be three-fourths of their whole time, kept with their heads and tails down, and their feet in a position unfavourable to shape and action. The evils which are supposed to result from this practice, are stated at length by the patentee.

The improvements claimed, are, first, in the elevation of the manger, so that "the horse can barely get his head over the perpendicular side of it, next to him, so as to reach his food, lying in the bottom of the manger." As this height should be adapted to that of the horse, the manger is made to slide up and down between posts.

AMERICAN PATENT WRINGING MACHINE.

By W. NELSON, Batavia, Genessee county, New York, Nov. 13, 1828.

It consists of two standards of stott timber, connected to each other by any proper framing, and standing three feet, more or less, apart. Into one of these standards a circular piece of wood, which is called a head block, is firmly fixed; a similar piece revolves, op-

posite to it in the other standard. These head blocks are perforated with holes, through which a rope is passed, going alternately from one block to the other. The several lengths of rope are then formed into a set of net-work, by strong cord, interwoven crosswise, thus forming a kind of sack, or net, into which the articles to be wrung are placed. By turning the moveable head block, by means of a crank, or lever, the ropes are twisted upon the contained articles, which are thus strongly compressed, and may be wrung nearly dry.

Machines very similar to this have been long known. A Mr. Beecham obtained a patent for one in England, about forty years ago. Their fate, however, appears to have been similar to that of their relatives, the numerous family of the *washing-machines*, most, if not all, of which have retired to lodgings in the cellar or the garret, and left the soap-suds in the undisputed possession of the old-fashioned washing tub. It is only in manufactories, or large public establishments, that they have continued in use.—*Journal of the Franklin Institute.*

ON SEA-WALLS, PIERS, AND BREAKWATERS.

WE have received from Mr. David Gordon, of Claremont-square, the copy of a letter addressed to the Duke of Wellington, containing a proposition to employ the industrious poor in gaining from the sea those immense tracts of inundated land which are to be found in Ireland from Lough Larne to Cork; and in England, from the Humber to the Downs; in the British Channel; and on the coast of Cheshire, Lancashire, &c.

On the importance of gaining land at the estuaries of rivers, Mr. Gordon observes,

“All rivers are constantly carrying a portion of the most fertile particles of the earth into the ocean. When tillage is adopted, the quantity of these most valuable particles, which are carried away by every shower, is vastly increased—so that if means are not constantly employed to bring them back, or supply other nourishing particles, the country around the greatest cities becomes a desert. The adoption of common sewers, and the increasing cleanliness and comforts in all the domestic arrangements in London and other great cities, now hurries off to the ocean immense quantities of the most valuable manure, ninety-nine hundredths of which might be easily preserved to fertilize the low lands, by means of the sea-walls and embankments which I propose at the estuaries of the rivers.”

As the letter to the Duke does not furnish a description of Mr. Gordon's plan, we proceed to a second letter by the same intelligent engineer, addressed to the Editor of the *Star*, from whence we extract the following:—

“Hitherto, in the construction of sea-walls, piers, and breakwaters, especially the two first, great care has been taken to obtain,

er, at great expense, to lay a good foundation, to hew the stones smooth, to make close joints, and to use the best cement. I humbly, but confidently submit that, where the foundation is to be considerably under low water of spring tides, it is, in almost every instance, superfluous to be at any expense to lay the foundation; and that hewing the stones, making close joints, and using cement, is, in every instance where the building is intended to resist water violently agitated, incurring an enormous expense to do what is incalculably injurious. It is, in fact, aiding the water to destroy the structure.

"The late justly celebrated Mr. Rennie, in the immense works at Plymouth, Dublin, Port Patrick, &c., adopted the mode of throwing in loose stones, and letting them find their own base, for the purpose of forming a breakwater; but, unfortunately, even his splendid genius seems not to have adverted to the circumstance, that if an impetuous billow can move a stone the millionth part of an inch, that stone, sooner or later, must become a rolling stone; and, therefore, all those noble structures above-mentioned must, in process of time, become heaps of rolling stones, unless the outside shall be secured, for some distance, under low water of spring tides. If throwing in stones promiscuously could form a permanent breakwater, there would have been many in the world; because many promontories and cliffs have been thrown into the sea, and yet no where does there exist a natural breakwater of loose stones.

"When a large body of water, violently impelled, passes or recedes rapidly from a solid body, a vacuum is formed, if the depth of the water is considerable, or if it acts near the surface, a hollow filled with air is formed. In either case, the power of suction, as it is popularly called, is great, caused by the total or partial removal of the atmospheric or hydrostatic pressure. In the first case, it may be called tremendous, being no less than 2,160 pounds on every superficial foot. What an immense force, therefore, must the sudden recoil of a large wave exert on the lower strata of a deep solid sea-wall, pier, or breakwater. This explains the reason why these structures almost always give way at or near the foundation; and are pulled down towards the stormy sea, unless the sea makes a breach over the wall, in which case the projectile force and the power of suction are both exerted in the same direction, and then the destruction becomes very rapid.

"When a large wave is violently impelled against a solid body, its projectile force acts in two ways. First, by compressing a volume, or plate of air, and pressing this elastic and expansive fluid against the resisting body; and, secondly, by the blow which a large united body of water gives when violently impelled.

"To prevent the injurious effects of suction, it is only necessary to construct the sea-wall, pier, or breakwater, with as many interstices as possible, communicating freely with the open air above

high water, so that the recoil of the wave may always be followed by the air, and thus preserve the atmospheric equilibrium.

"The first above-mentioned injurious effect of the projectile power of water, by forcing against a sea-wall, pier, or breakwater, a compressed volume, or plate of air is completely prevented by forming the interstices already mentioned; and, to prevent the second injurious effect, it is proper to present as irregular and pointed a surface as possible—because it is only when water is kept in a large body that it is so very powerful—the instant that it is separated into small particles, and mixed with air, which is a compressible substance, its great power is destroyed. It is well known to the poor fishermen on the coast of Scotland and Ireland, that a whin-bush held over the gunwale of a boat is more powerful to guard off a threatening wave, than any other bulwark.

"Having, in these preceding observations, shortly stated my ideas how violently agitated water acts, and the precautions necessary to guard against its injurious effects, I will still more shortly state how I propose to carry the latter into effect, which is merely to construct the sea-wall, pier, or breakwater, or at least those sides which have to resist the sea, with large irregular, pointed, hard stones, built up like a pile of cannon balls. By these simple means all the benefits I have mentioned will be obtained, and nothing but the decay of the stones, human agency, or a convulsion of nature, can injure the structure. It will be as permanent as the buildings in Egypt, and the sea, instead of rising to an immense height when it strikes, will be found only to ascend a few feet in a solid body; all that rises higher will be mere innocuous froth and spray.

"By such structures every considerable harbour in the kingdom could be easily made accessible at all times of the tide, every part of the coast protected from encroachment, and immense tracts of rich land gained, which would both add to the wealth of the nation, and give employment for many years to hundreds of thousands of the labouring poor, as is more particularly pointed out in my former communication.

"Should these observations excite public attention, I shall be glad to furnish a more detailed account of my plans for any periodical work, the Editor of which may be desirous to give it insertion.*

"The same principle of construction is generally applicable to dams, or weirs, &c., on rivers."

* Entertaining a favourable opinion of Mr. Gordon's plan, we shall take pleasure in publishing any detail which he may have the kindness to supply us with.—EDITOR.

MISCELLANEOUS INTELLIGENCE.

TO MAKE KITCHEN VEGETABLES TENDER.—When peas, French beans, and similar productions, do not boil easily, it has usually

been imputed to the coolness of the season, or to the rains. This popular notion is erroneous. The difficulty of boiling them soft arises from a superabundant quantity of gypsum imbibed during their growth. To correct this, throw a small quantity of subcarbonate of soda into the pot along with the vegetables, the carbonic acid of which will seize upon the lime in the gypsum, and free the legumes from its influence.—*Bulletin des Sciences.*

PROPORTION OF POWER TO VELOCITY IN STEAM-BOATS.—The following table of the power necessary to give a steam-boat different velocities, has been published by Mr. Tredgold:—

3 miles per hour	5½ horses' power.
4	13
5	25
6	43
7	69
8	102
9	146
10	200

WHOLESOMENESS OF COFFEE.—The general effect of coffee upon the nervous coat of the stomach is, unquestionably, a gentle stimulant; and, as most substances of that class, has, to a certain extent, a tonic power, it is not hesitated to be recommended to invalids whose powers of digestion have been debilitated by stimulants of a more powerful character, such as fermented liquors, wine, spirits, &c. The custom of taking coffee after a late dinner, and just before retirement to rest, is bad; because its stimulant property upon the nerves of the stomach exerts a power destructive to sleep—it promotes an activity to the mind, and gives a range to the imagination which prevents self-forgetfulness, that sure harbinger to repose.—*Manual for Invalids.*

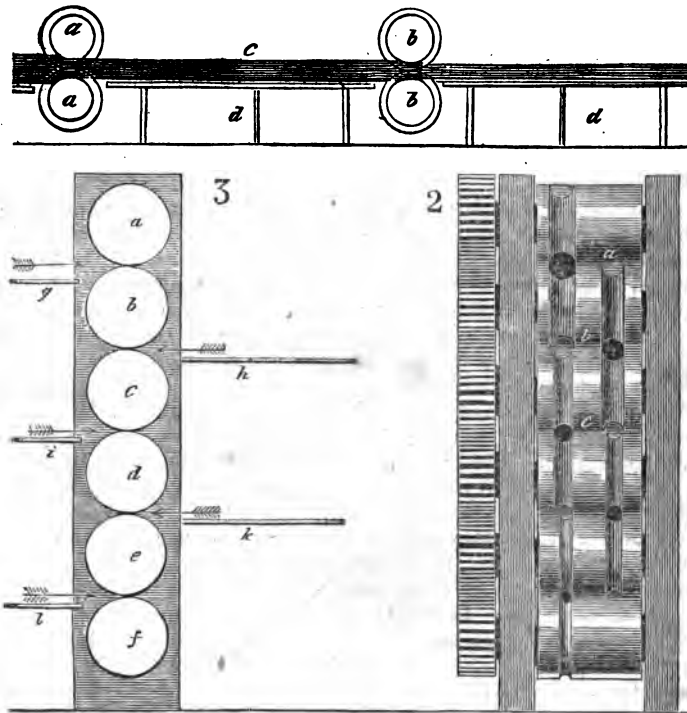
PRESERVATION OF PLANTS FROM SLUGS.—A gardener recommends for preserving cabbages and cauliflowers from slugs, the spreading well-dried chaff round the young plants under hand-glasses, and some round the outside of the glasses. The slugs in their attempts to reach the plant find themselves immediately enveloped in the chaff, which prevents their moving, so that in the morning hundreds of disabled slugs may be found round the outside of the glasses, and be destroyed.—*Gardener's Magazine.*

VACCINATION IN LONDON.—According to the last report of the National Vaccine Establishment, dated the 2d of March, the number of persons who have died of small pox in the course of the last year, within the bills of mortality, amounts to 598; and the report states, that there is no reason to think that this distemper has abated anything of its virulence, or that it is more controullable by the expedients of medical art, than it was in the times of its more general prevalence; for that it still proves fatal to one out of three of those who take it in the natural way. The report further states, that more than 10,000 of the poor have been vaccinated in London and its neighbourhood, since last year's report; and that from the

records of the last year's experience of the Small Pox Hospital; it appears that no patient admitted there under small pox, after vaccination, had been vaccinated by any officer of the national establishment; whence it is presumed that when the operation has been performed with due care and intelligence, it is much less liable to be followed by small pox. The correspondence of the establishment with various parts of the world, which is represented as having become more extensive than ever, is stated to warrant the conclusion, that there is no increase in the proportion of cases of small pox after vaccination, and that the efficacy of the vaccine lymph is not weakened or deteriorated by transmission through any number of subjects in the course of any number of years.

NECESSITY OF WATER TO THE VEGETATION OF SEEDS.—Seeds, says an article in the *Gardener's Magazine*, if kept perfectly dry, will never vegetate. They require, therefore, some kind of moisture, and that moisture must be supplied by *water*. Beans and peas may be kept moistened by olive oil and alcohol only, but otherwise under circumstances favourable to vegetation, without their showing the least symptom of germinating. Water, then, is an essential, the most appropriate quantity varies with the species of plant. If, in excess, it is more prejudicial than a total deficiency; since, in the first case, it excites decay, in the latter event the seeds remain unaltered. That the first case ever occurs in practice, arises from the faulty cultivation of the soil; for if properly drained, however retentive it may be, no natural deposition of moisture is ever too abundant or continuous.

EDUCATION OF SPANISH REFUGEES.—An institution, highly honourable to all parties concerned in promoting and establishing it, has been recently formed in London for the instruction of the children of the unfortunate Spanish refugees now in this country. The idea of forming this kind of college, originated with the Senor Nunez de Arenas, who, having volunteered to instruct a class of his young countrymen in mathematics, at his own residence, found his lessons attended not only by the youths whose education was in progress, but by many emigrants of maturer years, who, while they refreshed their knowledge of the sciences, found an agreeable diversion to the melancholy reflections engendered by their situation. This circumstance being communicated to the other refugees in town, distinguished by their acquirements, a plan was devised for extending the advantages derived from the lessons of M. Arenas to the other branches of knowledge, and the refugee committee having come forward with necessary assistance to set the project on foot, and the trustees of the Mechanics' Institution having generously volunteered the use of their establishment; a Spanish college has been actually instituted, and upwards of two hundred names of students are registered. The instruction is gratuitous to refugees and their children, and to the members of the Mechanics' Institution. But the classes are open to other students, on payment for the respective courses.—*London Magazine*.



ON AN IMPROVED MODE OF MAKING BAR IRON.

By the EDITOR.

THE usual, and new almost universal method of making bars of malleable iron, is, by passing the mass of red-hot metal successively through a series of grooves of various sizes and shapes, made in the peripheries of two large heavy cylinders of solid metal, which are made to revolve in contact with prodigious force, steam-engines of from 10 to 100 horse power being generally employed for the purpose. The grooves are of course the size of the transverse section of the bars formed; if for round bars, there is a semicircular groove on each of the rollers, the edges of which coming together opposite, complete the circle: if for square bars there is a triangular groove on each roller, which being brought together complete the square, diamond-wise. By a somewhat similar arrangement, grooves of a great variety of figures, are made to produce bars or rods of as many different shapes.

As the mass of iron or "bloom" is of sufficient magnitude to

form the entire bar when drawn out, and as there is occasion to pass it through numerous grooves to complete the operation at one heat, the rollers are usually made from 6 to 10 feet in length, to accommodate these circumstances. The longer the rollers the weaker they are; therefore to obtain sufficient strength, they are made of great thickness and weight. At one extremity of each roller is a spur-wheel, which takes into the opposite one, causing both rollers to revolve in opposite directions, by the motive power, and compress whatever is passed between them. The manual operation is as follows:—

The furnace door is opened by means of a long lever and chain, when the furnace-man, exposing himself to a heat, (absolutely appalling to a stranger) drags out of the furnace with a pair of long tongs, the lump of iron or bloom, which is instantly drawn to the rollers that are revolving with great velocity, and applied to the length of the grooves; between which it is *shot through in an instant*, coming out on the opposite side of a considerably lengthened figure, and of a uniform thickness: here, it is taken up by *two* men with tongs, and *lifted over the rollers back again*, to be passed through the next groove, as the rollers continue to revolve in the same direction. The bar is then in a similar manner passed successively between all the other grooves, to bring it to the required thickness. As the bar lengthens in this process, the labour of the men increases, as they *support* the bar with their tongs, as it is made to traverse *backwards and forwards*; and they are all this time, exposed to a scorching heat, that no person unaccustomed to it could withstand. In order to get the bar completed as quickly as possible, that it may not get too cool, great dexterity, and severe, unremitting, and unflinching exertion on the part of the men are necessary. Bar after bar follows to the rollers from the furnace-man, till the whole charge of the furnace is extracted. While this has been going forward, other furnaces contiguous to the rollers, are employed in preparing other charges to undergo a similar operation; the timing of which is so arranged as to allow of pauses in the work, for rest to the men. To keep the rollers from getting much heated by their contact with the red-hot iron, small streams of water are continually running over them. It appeared to us that some danger and inconvenience resulted frequently from this circumstance; the iron being at a white heat when drawn from the furnace, and having an oxidated surface, coming in contact with the cold water, bright red-hot scales are thrown off the surface, and over the men, having the appearance of a brilliant "fire-work."

Although the process of making bar-iron, which we have thus briefly sketched is one of an extremely imposing and interesting nature, it has occurred to us recently that it is susceptible of some improved arrangements, by which the manual labour may be very greatly reduced, the personal danger and inconvenience diminished, the cost of the machinery lessened, and one-half of the power of the engines saved. These pretensions seem to be large, but we are

not sufficiently acute to discover that we have made any error in calculating this magnitude: our readers will judge for themselves.

The first idea that occurred to us, was to place a series of pairs of *small* rollers (only 5 or 6 inches wide) one before the other, so that the bar might pass in one continued straight line from groove to groove, until finished of its intended dimensions; and during its progress to be supported by a furrowed shelf of iron plate, which would also accurately guide the bar between the successive pairs of rollers. This plan is explained by the diagram, Fig. 2, in the preceding engravings; *a a* being a section of the first pair of rollers, the inner circles of which represent the depth of their grooves; *b b* are the second pair of rollers, of which there may, of course, be any number; *c* shews the bar diminishing in its thickness, and increasing in its length as it proceeds. By this method, it is evident, a bar would be formed in about one-third the usual time; if we admit this, it is clear that the power of the engine would be equal to do three bars, while one is being done by the usual method. If we likewise admit that the manual labour of the rolling men is reduced to one-third *during their occupation*, which is pretty evident, it follows that one man will do the work of *nine*; because one man does the work of three in a third part of the time. It is also deserving of consideration, that the iron being passed through quicker, it is hotter, and consequently that a less force is requisite to compress it between the rollers. But the most important result of the superior temperature of the metal during the operation, is, that a *better* bar is formed; "*to strike the iron while it is hot*," is a maxim too well understood and appreciated, to need further remark than this—that bars of iron passed through the rollers not sufficiently hot, crack at their edges, and are otherwise (frequently) so unsound, as to require welding by the smith.

Without mentioning here some other advantages which would be derived from this arrangement, we will proceed to notice the objections that may be raised against it. It may be said that "the communicating power to such a distance would be inconvenient," to which we reply this is often done from necessity; but in those cases where it is not, the bar might be returned through another set of rollers, placed alongside, or above, or below the others, the motion being given in a reverse direction, by common spur-gear. A second objection might be, that the bar "would not probably deliver itself regularly from one pair of rollers, and be received by the next;" on this point we would observe, that the distances between the rollers might easily be regulated to the size of the bar introduced. At the commencement of the operation, the bar should be completely out of one pair of rollers before it entered a second, and so on to the third and fourth, but after that, the bending and curling of a comparatively thin bar would not be productive of any inconvenience in the process, nor injure the quality of the manufacture.

The next plan we have to suggest, is another modification of the

first : it is represented by Figures 2 and 3 ; Fig. 2. exhibiting an end view of six rollers *a b c d e f*, placed one over the other, with the usual spur-gear mounted upon their axes, and giving each of them motion *contrary ways*. Fig. 3 exhibits a section of the same arrangement, the arrows shewing the course which the bar takes through the rollers successively. We will suppose the shelf *g* to be upon a level, or somewhat lower than the mouth of the furnace. Let the "bloom" be then *slided* down upon *g* and be pushed forward between the rollers *a* and *b* ; the instant the rollers take hold, it darts between them and falls upon the shelf *h*, which is a gradual motion, as it curls downwards. That end of the bar which left the rollers *a* and *b* first, takes the position shewn by the arrow above *h*, and being assisted by a slight push it passes between *b* and *c*, falling upon *i* ; then through *c* and *d*, it falls upon *k* ; next through *d* and *e* into *l* ; and from *l* through *e* and *f*, on to others, which may be added below, or be carried straight forward to another series of rollers placed before it. The two systems it will be observed, may be employed either separately or conjointly. By the first plan, the quantity of space, or area of floor required, is the same, as by the usual plan of rolling, though of a different figure : by the second plan, the room required is only about a sixth part, and this would probably, for various reasons, be found the most convenient.

It need scarcely be observed, that the diagrams do not represent more than the principles of the arrangement of the rollers and gear ; the framing, supports, plummer blocks, regulating apparatus, &c., are omitted as unnecessary to our explanation. But we ought not to omit stating, that the axes of the rollers are proposed to be made so as to *take out* on one side, to enable a roller to be displaced and substituted in a few minutes.

The facility of changing the rollers, will tend to prevent those stoppages in large works, which often take place. The shortness of them, gives them immense strength, so that they need not be so heavy, as an equal length of the large roller ; and from their convenient handling may be turned to beautiful surfaces in common lathes. The expence of such machinery must be much less than the ordinary kind, and the manufacture of iron produced by them, of a very superior description.

AMERICAN PATENT FOR PROVING HEMP AND CHAIN CABLES

By JOHN JUDER, Washington City, November 29.

THE power is obtained, as in some similar machines, by compound levers with long and short arms. What is claimed as new, is the making the bearings, or fulcrums, of all the levers in the form of those of a scale-beam, usually called the knife-edge suspension, the whole being made true and hard, the friction is consequently reduced to a mere trifle.

CONCENTRATION OF SPIRITUOUS LIQUIDS.

We have long thought that the rectification and concentration of alcoholic liquids might be conducted with great *economy*, by means of vessels made of animal membrane, similar to that of bladders. With that object in view, we suggested some mechanical arrangements for the purpose, in our first volume (present series); which subsequent consideration of, has confirmed us in the opinion, that it would be found of great practical utility. The following information on the subject, extracted from Ferrusac's Bulletin, Mai, 1828, seems calculated to place the matter beyond a doubt.

M. Sœmmering, in a memoir in the Academy of Sciences of Munich, states, that alcohol, in a vessel covered with a bladder, the latter not being in contact with the fluid, loses, when exposed to a dry atmosphere, much of its water, and becomes stronger. But if the vessel thus closed, be exposed to a damp air, the alcohol attracts humidity, and becomes weaker.

In a second memoir, the author states more particularly, the effect of bringing the alcohol into more immediate contact with the membrane. If a bladder be filled with 16 ounces of alcohol at 75°, and be well closed and suspended over a sand bath, or placed near a warm stove, so as to remain at the distance of more than an inch from the hot surface, it becomes in a few days reduced to a fourth of its volume, and is nearly, or quite, anhydrous.

M. Sœmmering prepares for this purpose, calves' or beeves' bladders, by steeping them first in water, washing, inflating, and cleansing them from grease and other extraneous matters, tying the ureters carefully, and then returning them to the water in order to clear off more fully the interior mucus. After having inflated and dried the bladders, M. S. covers them with a solution of Ichthyocolla, one coating internally, and two externally. The bladders thus become firmer, and the alcoholic concentration succeeds better.

It is better not to fill the bladder entirely, but to leave a small space empty. The bladder is not moist to the touch, and gives out no odour of alcohol. If the latter be below 16° Baume, the bladder then softens a little, and appears moist to the touch. Bladders prepared as above, may be employed more than a hundred times, though they at length acquire a yellowish-brown colour, and become a little wrinkled and leathery. The swimming bladder of the salmon is not fit for these experiments. Alcohol of 72° was put into one of them, and after an exposure of 32 hours, it had lost more than one-third of its volume, and was weakened 12°. The alcoholic vapour was perceived by the *smell*.

Into two bladders of equal size was put, into one, eight ounces of water, and into the other, eight ounces of alcohol. They were placed side by side, exposed to a slight heat. In four days the water had entirely disappeared, while the alcohol had scarcely lost an ounce of its weight. Mineral waters, and that of wells, evaporate and deposit on the interior of bladders, the saline matters which they contain.

If the heat be conveniently managed, absolute alcohol may be obtained in six to twelve hours. Solar heat is even sufficient to produce an hydrous alcohol.

Wine placed in prepared bladders, contracts no bad odour; it assumes a deeper colour, acquires more aroma, and a milder taste, and becomes generally stronger. Spirits of turpentine of 75°, contained in a cylindrical glass closed with a bladder, lost nothing in four years. Concentrated vinegar lost the half of its volume in four months; the other half acquired more consistency, and had no longer an acid taste. The water of orange flowers was about one-third evaporated in a few months, appeared to have a stronger odour, and consequently had lost nothing of its volatile principle.

AMERICAN PATENT BRICK AND TILE-MAKING PRESS.

By JAMES PARKER, M. D. of Gardiner, Maine, Nov. 27.

A STRONG wooden bench is placed horizontally; at one end of this is a brick mould, made of iron, cast in one or more pieces. A piston slides into this mould, having a rack at the back of it, into which a pinion works, which is moved by a lever. There is also another lever or treadle, below the bench, upon which the foot is to be placed, by which a powerful pressure is made upon the end of the rack, in aid of that given by the hand, which moves the lever and pinion. A second lever under the bench, to which the foot is shifted after the brick is pressed, raises it from the mould, and delivers it upon a board, when another is placed in the situation to be pressed.

AMERICAN PATENT IMPROVEMENT IN CANAL GATES.

By JOHN F. KING, of Waterford, New York, Nov. 29.

THE general construction of this gate is the same as usual. The novelty claimed is in the following words:—

"What I claim as my improvement in the above-described gate, and fixtures, is the gate, together with the gudgeons, or pivots on which it turns, being made of one entire piece of cast metal, instead of those heretofore used, made of wrought iron, or this and cast iron together, or of wood and iron. I likewise claim the manner of securing the top gudgeon by means of a slide, instead of a clasp or hasp, and bolts, or staples, as heretofore used."

The manner of securing the upper gudgeon above referred to, is by one half of the box, or bearing, within which it works, sliding upwards in a dove-tail, or groove, so that it may be removed and replaced under water.

PATENT SEA-TABLE APPARATUS.

By Lieut. HUGH EVANS, and WM. R. H. KING, of Snow-hill, London, 1927.

THIS invention is designed for holding dishes, plates, glasses, &c., securely upon a table, when a vessel may be rolling or pitching at

sea. It consists of a large ring of metal to hold a dish, which is clamped to the table by one or more pieces of metal extended from it. Smaller rings are jointed to the large ones which open outwards, and are then used to hold plates, bottles, cups, knives, forks, &c. The apparatus when not in use, folds up into a very compact body.

MANUFACTURE OF SALT BY ATMOSPHERIC EVAPORATION.

By R. BAKEWELL, Esquire.

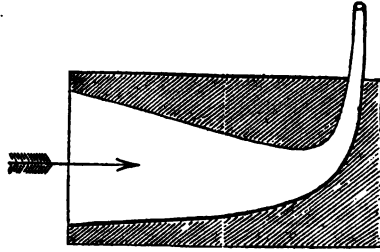
THE Maison de Cordes was invented by an ingenious Savoyard, named Buttel. It is forty yards in length, and eleven wide: the roof is supported upon six arches of stone-work; the intermediate space, on the sides, being left open. In every one of these divisions are twelve hundred cords, in rows of twenty-four each, suspended from the roof and tight at bottom. The cords are about sixteen feet in length. The water is raised to a reservoir at the top of the building, and distributed into a number of small transverse canals, each row of twenty-four cords having one of these canals over it, which is so pierced as to admit the water to trickle down each separate cord, drop by drop. The original intention of this building was to crystallize the salt itself upon the cords, for which purpose the water was made use of from the pans, after it had deposited a quantity of salt in the first boiling; to save the expence of fuel on a second boiling, the residue water of the first boiling, by repeatedly passing over the cords, deposited all its salt in about forty-five days; and the cords were incrustated with a cylinder of pure salt, which was broken off by a particular instrument for this purpose. This process is at present abandoned for crystallizing; but the cords are still used for crystallizing and evaporating; and are found to answer better for the higher concentration of the water than the faggots. This method did not answer for the first evaporation, because the water rotted the cords; but it was discovered that the cords were not soon injured by it when it had acquired five degrees of strength. The cords, we were informed, had many of them remained thirty years in use without being changed; indeed they were so thickly encased with depositions of selenite, that they were defended from the action of the water. This mode of evaporating is found to be more expeditious than that of the faggots. In the Maison de Cordes, the evaporation goes on more speedily in windy weather, than in the Maison d'Epines, as might be expected from the more ready access of air to the surface of the water. The cords are double, passing over horizontal rods of wood at the top and the bottom to keep them firm in their positions, and at regular distances from each other. I did not see the cords without their envelope of selenite, but I was informed that they were not thicker than the finger. With the incrustations they were become as thick as the wrist.

PROPOSED IMPROVEMENT OF BUOYS.

TO THE EDITOR.

London, May 10, 1829.

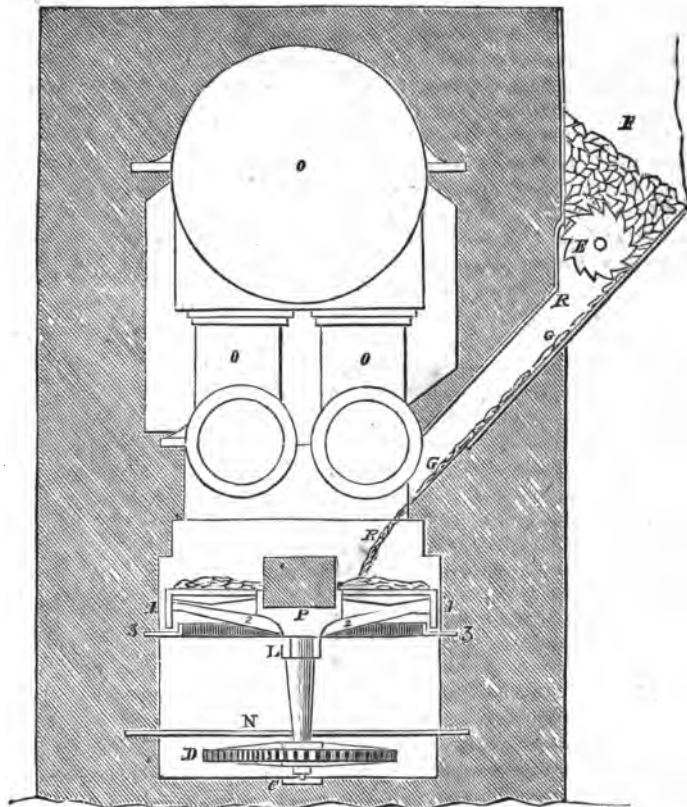
SIR—In passing round the Land's End in a steam vessel, in the month of December last in a gale during the night, I was struck with the roaring of the sea on the Wolf Rocks, (for which we run); and with the great height to which the water was propelled, by striking on it; and by which it was enveloped in a blaze of phosphoric light. This circumstance, with the fact of a column of water being projected to the height of 60 or 80 feet, on a small island in the vicinity of Malta, by the operation of the sea through a perforation in the rocks, suggested to me the possibility of making this action a means of warning to vessels approaching banks, &c. It is well known that buoys are of very little service when most required—at night, and in a gale; being in the latter case buried under the sea. Now I propose that each buoy shall be moored by one end, which shall, of course, always be presented to the sea, a canal, bell-mouthed at the entrance shall perforate the buoy from the point by which it is moored to its centre, running in a horizontal direction; it shall then be turned up vertically, and open on the top of the buoy, being narrowest at that end; a hollow tube may farther be carried up to any height wished above the buoy. Now the sea, forcing into the bell-mouth of the passage, will throw a column of water up to a height more or less according



to the impetus, and they will shew the place of the buoy at a considerable distance; that the column may not be scattered too soon, the canal may somewhat point forward, so as to meet the wind in some degree, and to add to the solidity of the column, and the propulsive effect, the small, upper end of the tube, may be fitted with a valve which may be made self-loading, by having a piece running transversely, of proper dimensions, so as to present a surface to the wind, and thus offer resistance to the opening of the valve; the air will therefore be condensed between the valve and the sea, and yield with some difficulty; so that the propulsion of the column will be more rapid and continuous, and better able to resist the action of the wind in its ascent. The expansion of the condensed air will also cause a report at each expulsion.

I am, Sir, &c.

J. UDNY.



ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

Continued from Page 293.

WE have now to describe another invention for burning the smoke of a steam engine, or other furnace, which at the same time supplies itself constantly with small quantities of fuel, and equally distributes them over the grate. It is the invention of Mr. John Steel, of Dartford, and is denominated by him a *Mechanical Smoke-burner*.

The fire grate (of any suitable dimensions) is of a circular form, surrounding the centre piece P, moving on an upright axis, the toe of which turns in a centre C, and the upper is supported by a cross-bar at L, which is made fast in the brick-work. E, is a fluted roller, for the purpose of supplying the fire with coals, from the hopper F, which should be furnished with a grating or top, so as only to admit pieces of coals of a limited size. G, G, is an inclined plane,

set at such an angle, that the smallest of coals will slide down. At D. is a common toothed wheel, to be worked by a band, chain, or any other convenient mode of communicating motion. The fire door and frame may be situated in any convenient part of the circular frame, which will depend, in a great measure, upon the form of boiler to which the apparatus is applied; that represented at o o o in the figure, represents one of the tubular kind. N. is a metallic plate for the ashes to drop on. 1. 1. show the ring or rim which surround the grate bars, and 2. 2. the arms, which support it and the grate bars. The rim is made somewhat deeper than the bars, and turns round in an iron trough. 3. 3. filled with sand or ashes to prevent the air from passing between the rim and the brick-work.

Now, suppose a fire to be lighted in the grate, and the grate and roller E. be put in motion, it is plain, that such coals as lodge in the notches of the roller, will as the roller turns round, be dropped in the inclined plane, and from thence scattered on a portion of the fire, as at R; and as the grate is moving round at the same time, another part of the fire is continually presented to each fresh supply of coals. The grate is made to turn round in such a direction, that the coals are immediately afterwards presented to the fire door, which is therefore placed contiguous to it. At this part, the combustion is most vivid from the ingress of air, and the fuel being scattered thereon, in an infinity of parts, and the smoke or hydrogen gas, having to pass over the whole of the surface of the fire, the combustible matter is wholly consumed.

In using this furnace to boilers where there is no steam engine, any other mechanical power may of course be employed, or it may be turned by hand. Whenever the apparatus may be out of repair, it is only necessary to stop the wheel-work, which communicated the motion to the grate, which may remain stationary, and be supplied in the common way by a shovel, at the fire-door, until the disordered parts are put in repair.

PATENT STEAM CARRIAGE.

By JAMES NEVILLE, of Shad Thames, 1827.

THE patentee proposes to employ (as other people *do*) vibrating steam engines, the piston rods of which act upon the throws of a crank standing at right angles to each other, in order to dispense with the necessity of a vibrating beam. The running wheels receive their motion from the crank, and make the same number of revolutions, but in going up hill, or over bad roads, the power and velocity is to be changed according to circumstances, by intermediate wheels and pinions. The boiler employed by the patentee, is one of the tubular kind (patented by him in March, 1826) and the furnace is to be excited by a blowing machine. The running wheels are to be made of iron; and to prevent their *slipping* round,

the tire of the wheels are studded with pins extending about half an inch from their peripheries. These pins sticking into the ground are intended to prevent the wheel from slipping. As this *novelty* is claimed by the patentee, our old-fashioned wheelwrights must in future not let the heads of their tire nails stick out beyond the surface of the tire.

Another method of preventing the wheels from slipping round is still more remarkable. On the tire of the wheel, are to be fixed as tangents to the circle, a number of thin pieces of steel, by fastening one end of each of them to the periphery; these tangent pieces, as the wheel rolls round, coil themselves closely on the periphery, unless, peradventure, an ugly ill-natured stone thrusts itself between, which forms either a fulcrum to tear off the tangent piece, or to do what is *worse*.

It is to be hoped that the patentee has included in his claim, "the application of this invention to other purposes," as we conceive it would form a most elegant appendage to the table. Let the reader imagine, a beautiful little model of this locomotive carriage employed to transmit the wine bottles round a table, cracking filberts and walnuts in its progress, and delivering them to every guest along with the wine. It does not suit the sober, musty columns of this journal, to speculate much on this subject, or we should give a few hints as to the nature of the fuel, and the liquid to be vaporized, which would go far to moderate the practice of taking tobacco, snuff, &c.

DR. WOLLASTON'S NEW BAROMETER.

A very important paper from the pen of this distinguished philosopher has been read to the Royal Society, which may be considered as his last bequest to the scientific world. The instrument described in this paper is capable of measuring, with considerable accuracy, extremely small differences of barometric pressure. It was originally contrived with the view of determining the force of ascent of heated air in chimneys of different kinds; but as its construction admits of any assignable degree of sensibility being given to it, it is susceptible of application to many other purposes of more extensive utility. A glass tube, of which the internal diameter is at least a quarter of an inch, being bent in the middle into the form of an inverted syphon, with the legs parallel to each other, is cemented at each of its open extremities into the bottom of a separate cistern about two inches in diameter. One of these cisterns is closed on all sides, excepting where a small horizontal pipe opens from it laterally at its upper part, while the other cistern remains open. The lower portion of the glass tube is filled with water, or other fluid, to the height of two or three inches, while the remaining parts of the tube, together with the cistern, to the depth of about half an

inch, are filled with oil, care being taken to bring the surfaces of water in both legs to the same level, by equalizing the pressure of the incumbent columns of oil. If the horizontal pipe be applied to the key-hole of a door, or any similar perforations in a partition between portions of the atmosphere in which the pressures are unequal, the fluids in the corresponding half of the instrument will be depressed, while it is raised in the opposite one, until the excess of weight in the column that is elevated will just balance the external force resulting from the inequality of atmospheric pressure upon the surface of oil in both cisterns. This, however, is equal only to the difference between the weight of the column of water pressing on one side, and that of an equal column of oil which occupies the same length of tube on the other side.

MISCELLANEOUS INTELLIGENCE.

POPULATION OF COLOGNE AND BONN. EAU DE COLOGNE.—Doctor Jacob, in a recent work on Cologne and Bonn, and their environs, states the amount of the population of the former place, in 1827, at 57,022, including a garrison of 4,523 men. In the same year, the number of manufactories of Eau de Cologne amounted to 14, which exported 500,000 bottles by water carriage, besides a vast quantity, not ascertained, by land. Bonn, according to Dr. Jacob, contains 1,110 houses, besides churches and public buildings, and 11,387 inhabitants, including 697 soldiers of the garrison; and in the summer of 1828, 886 university students.—*Allgemeines Repertorium*, 1829.

ANCIENT ORNAMENTS.—An elegant and very useful work has been recently published by Carpenter and Son, under the title of a "Selection of architectural and other ornaments, Greek, Roman, and Italian; drawn from the originals in various museums and buildings in Italy." The work consists of five parts, each part containing five impressions from lithographic drawings. The collection of ornaments embraces specimens of the most esteemed nations and ages—the Greek, the Roman, and Italian of the fifteenth century. They are greatly varied, most of them are extremely elegant, and many display a playfulness and fancy which render them well calculated for adoption in articles of gold, silver, or bronze, or even of household furniture. A few pages of introduction and explanations of the plates in English and French constitute the letter-press. The authors are Mr. Jenkins and Mr. Hosking, architects, who have taken the pains to make the drawings on stone themselves. Hence what may be lost in boldness and freedom of delineation, is gained in fidelity.—*London Mag.*

DESTRUCTION OF EGYPTIAN MONUMENTS.—The magnificent antiquities of Egypt suffer constant demolition from the wantonness

and negligence of the government and people. The letters of the members of the French scientific expedition, now engaged in exploring that country, have enumerated eleven ancient monuments which have recently disappeared. In one instance M. Champollion, making a deviation from his route to visit the temple of Contralto, arrived on the spot ten days after its total destruction. A similar disappointment was experienced by him shortly afterwards with regard to the temple of Elythia; a loss the more regretted, as that edifice was a monument of the time of Sesostriis. Of two temples in Elephantis, which are now entirely lost, one, the larger of the two, is considered to have been the most perfect monument of ancient Egypt: besides these, the greater part of the small temple of Ombis has been recently carried away by the Nile.—*Le Normant's Letters.*

KING'S SHIPS LAUNCHED DURING 1828.—Bombay, 84 guns, in India early in the year; Hotspur, 46 guns, at Pembroke, in October; Speedy, 8 guns, cutter, at ditto, in summer; Nimrod, 20 guns, at Deptford, in ditto; Pearl, 20 guns, at Colchester, in ditto; Sparrow, 10 guns, cutter, at Pembroke, in ditto; Comet, 18 guns, at ditto, in ditto; Snipe, 8 guns, cutter, at ditto, in ditto; Royal Adelaide, 110 guns, at Plymouth, in July; Clyde, 46 guns, at Woolwich, in October.—*United Service Journal.*

KING'S SHIPS AT PRESENT BUILDING.—In the various dock-yards the ships above 50 guns, at present building, are as follows:—*Deptford*—Worcester, 52 guns. *Woolwich*—Trafalgar, 120; Thunderer, 84; Boscawen, 80; Chichester, 52. *Chatham*—Waterloo, 120; London, 92; Monarch, 84. *Portsmouth*—Royal Frederick, 120; Neptune, 120; Indus, 80; President, 52. *Plymouth*—Saint George, 120; Nile, 92; Hindostan, 80; Valiant, 76; Liverpool, 52; Jamaica, 52. *Pembroke*—Royal William, 120; Rodney, 92. *Bombay*—Calcutta, 84. *Kingston, Canada*—Canada, 104; Wolfe, 104. There are besides, 75 vessels of various sizes in different states of progress in the several dock-yards. Of these 14 are of 46 guns.—*United Service Journal.*

FRENCH MODE OF PUNISHING INVADERS OF PATENT RIGHT.—On the 29th of January last, the Cour Royal de France confirmed the sentence of the Tribunal of Correctional Police of 2d February 1828, from which appeal had been made, by which Count Michel Claude, the Sieur Elie Joel, and Nephan Lepman, were condemned for infringing the patent of M. Humbolt Conté, for crayons; the first, to three months' imprisonment, and a fine of 2,000 francs; the second to two years' imprisonment, and 2,000 francs; and the third to three months' imprisonment, and 400 francs.

INDIAN MODE OF FISHING.—The bay of Manta, in South America, has probably its name from the great quantity of mantas in those parts, the Indians being chiefly employed in taking those fish, which

they salt, and carry to the inland provinces. The Europeans cannot help admiring their dexterity in this kind of fishery, which they carry on in the following manner:—They throw into the water a log of wood, such as they use in making a balza, being about five or six yards in length, and near a foot in diameter; this log will be sufficient to support the weight intended, which consists of a net lying across one end of it, and the Indian standing in an erect position on the other. On this tottering vessel, assisted by only a single oar, he puts off to sea, about the distance of half a league, where he shoots his net. Another Indian follows him on a similar log, takes hold of the rope fastened to one end of the net, by which means the whole is expanded, and both Indians move towards the land, where their partners wait to draw the net on shore. In this occupation, the dexterity and agility of the Indians, in maintaining an equilibrium on round logs of wood, is truly amazing; for the continual agitation of the sea renders it absolutely necessary for them to be continually changing their position, and making different motions with their bodies; and what still heightens the difficulty, is, that the Indian is at the same time obliged to mind both his oar and his net, in drawing it towards the land. They do indeed sometimes, though very seldom, slip off their logs; but being excellent swimmers, they recover their bark, and in an instant place themselves in their former situation.

DESCRIPTIVE LIST OF PATENTS ENROLLED.

During the last Month.

PROPELLING.—John Melville, of Upper Harley-street, London, specified on the 18th of March, his patent for improvements in propelling vessels; which are intended to apply to the propelling of vessels by steam, or other power, in a direct line; and in such a manner that the propelling apparatus shall be little or no impediment to the progress of the vessel when under sail, thereby obtaining the advantages of motion by the power of wind on the sails, or steam acting by machinery on the water. There are three methods of effecting this purpose described; first, by attaching to traversing racks, on the sides of the vessel's paddles, so arranged that they will fold, and present but the thin edge of their hinged joints, when they are moved forwards, and open to expose a large surface to the water when they are moved backwards. These traversing racks are acted upon by wheels, on whose axles, which pass quite through the vessel, are fixed pinions, to be put in motion by a rack fixed on the end of the piston-rod of the steam engine. Secondly, by attaching similar paddles to rods passing through stuffing-boxes, in the stern of the vessel, below the water line; and these rods are to be connected with the steam engine piston through the medium of a wheel and pinions of similar dimensions to those used in the first method. In both cases the paddles are to be removed when the

power of steam is not required. The third method consists in the employment of a double acting pump, which receives the water from the bows, and discharges it, after passing through an air-vessel, at the stern, where the discharge-pipes are contracted, to give to the issuing water a greater degree of velocity. The patentee does not claim the invention of the folding paddles, or the forcing pump as applied to propelling, but merely his improved methods of applying these means.

HEAT COMMUNICATED BY THE CIRCULATION OF HOT WATER.—Thomas Fowler, of Great Torrington, Devonshire, stationer, specified on the 2d of April, his patent for certain improvements in, and for, raising and circulating hot water, hot oils, and other hot fluids, for domestic and other purposes. This apparatus is intended to communicate heat to apartments, to frames for copper-plate printers, to appropriate vessels for culinary purposes, to hot-houses for vines and other plants, or to any process or purpose where heat is to be applied at a moderate distance from the fire. It consists simply in a pipe proceeding from the upper part of a close boiler, which is kept quite full of water, upwards to the place where the heat is to be applied, and returns downwards to the lower part of the boiler or vessel to which the fire is applied. Through this pipe a continued circulation of hot water will take place; for the water in the boiler becoming hot, will naturally ascend to the greatest elevation of the pipe, where it is cooled by communicating heat to whatever surrounds it, and then it descends and again enters the boiler. The patentee describes various modes of construction and application, but the above is the principle upon which they all depend.

GAS APPARATUS.—John Brunton, of West Brunswick, Staffordshire, Engineer, specified on the 2d of April, his patent improvement, in the apparatus for manufacturing coal-gas. Mr. Brunton's specification describes four improvements in the construction of gas apparatus: he proposes to introduce, 1st, Conical retorts for generating the gas, to be placed with their bases downwards, in order to facilitate the operation of emptying the coke out of them after the gas has been extracted. 2d, The introduction into each retort of a conical pipe, perforated with holes, and communicating at the top with the gas-pipe to aid the escape of the gas, when the coals of which it is made are small. 3d, The construction of the furnace doors, which he makes of two parts to meet in the middle, making with each other an obtuse angle, like the flood-gates of a canal-lock: the one half is placed over the other, so that the upper part need only be opened for feeding the fire, and the lower part for cleaning out the furnace. 4th, A method of constructing the hydraulic main to prevent injury to its flanches, arising from the expansion to which it is subject from the different degrees of heat which it receives; this improvement consists in making one part of the tube moveable within the other, with an air-tight joining, and supporting the moveable portion on a lever and a weight, which will rise and fall as the tube contracts or expands.

SALTNESS OF THE MEDITERRANEAN SEA.

By directions of the late Dr. Marcet, whose experiments on sea water are published in the Philosophical Transactions for 1819, Captain Smyth, R. N., who was engaged on a survey of the Mediterranean Sea, procured specimens of sea water from great depths at different parts, to enable him to ascertain what becomes of the vast amount of salt brought into that Sea by the constant current which sets in from the Atlantic Ocean, through the Straits of Gibraltar, and which on the evaporation of the water must either remain in the basin of the Mediterranean, or be carried off by some hitherto unexplained means. Dr. Marcet being dead before the arrival of Captain Smyth's specimens, three of the bottles were given to the late Dr. Wollaston, for examination, who found the contents of one of the bottles taken up at about fifty miles within the Straits, from a depth of more than 4000 feet, to exceed in density distilled water, by four times the usual excess of sea water. It consequently left, on evaporation, more than four times the usual quantity of salt.

The result of this examination, detailed in a paper read before the Royal Society, seems completely to establish the opinion that a counter current of denser water exists at a great depth, which carries westward into the Atlantic Ocean as much salt as enters into the Mediterranean, near the surface, at the Straits of Gibraltar.

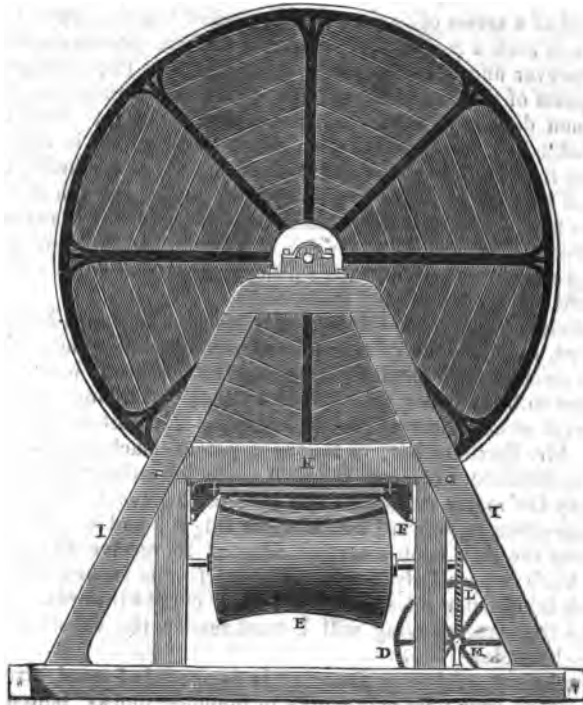
LONDON MECHANICS' INSTITUTION.

On Friday, the 22d of May, Mr. Toplis in a lecture on gravitation and the laws of falling bodies, introduced for its illustration, a machine from a design of his own for measuring uniform, accelerated, and retarded velocities. The machine, though of the simplest construction, was exceedingly convenient, and certain in its application, and it might be manufactured at a third of the cost of Atwood's machine, for the same purpose.

The frame which contained the pulley, over which the cord carrying the ascending and descending weights passed, is suspended within a tripod, and here it readily assumes a perpendicular position. The pivots of the pulley run in centres, instead of on the anti-friction rollers used by Mr. Atwood.

At the conclusion of the lecture, the members were informed that Dr. Birkbeck would commence a short course of two lectures, on the internal and external appearance of the earth, on Friday, the 29th of May, and that these would be followed by a course on the theory and practice of wood engraving, by Mr. Mason; and that Mr. Preston would deliver the third lecture of his course on electricity, on Wednesday the 27th.

It was also announced, that a quarterly general meeting of the members would be held on Wednesday the 3d of June; and that arrangements were in progress, to add to the number of the classes, one for mutual instruction, in English grammar, including literary composition.



DUKEBURY'S PATENT MACHINE FOR SPLITTING SKINS.

Communicated by Mr. CHRISTOPHER DAVY, Teacher of Architecture &c.,
Furnival's Inn.

THE methods in general use for the *splitting* of the skins of sheep and other animals, have hitherto been of a very imperfect nature, and may be classed under two distinct heads, those executed by hand, and those by machinery. The manual dexterity required in the first method, however great, is tedious, wasteful of the material, and liable to such frequent slippings of the knife *through* the skin, as to have led to an almost total discontinuation of it. The first attempt with which I am acquainted to execute this operation in a superior manner, by machinery, was about 30 years ago, by (if I recollect rightly) a Lieut. Parr, whose invention was adopted at the manufactory of Messrs. Bevington, of Neckinger Mills, Bermondsey, where I understand it is still used. The operation by that machine consisted * of passing the skin between two horizontal rollers, against the edge of a knife, to which was given a quick sawing or cutting motion. The lower roller was solid, but the upper one was

* This curious machine has been described in the Register, with engravings.

composed of a series of circular plates, packed together upon a central axis in such a manner, as to cause a uniform pressure upon the skin, however unequal it might be in thickness. The arrangement of the parts of this machine, and the whole contrivance, possess an uncommon degree of merit; but the execution of the work by it, notwithstanding its superiority to what preceded it, is defective, resulting from the backward and forward motion of the knife, which produced a series of ridges over the whole surface of the skin. It has also been found that the parallel sides of a cylinder is not a surface suited for the smooth extension of a skin; and the consequence of compressing it between such surfaces is to form little wrinkles, which the knife cuts off, and forms *holes*.

To obviate these several defects, a variety of machines have been suggested, in which the cutting-knives partook of a rotary motion; but the mechanical difficulties attending the operation were probably found to be so great, as to lead to their abandonment. By a very novel arrangement of parts, combining the most beautiful simplicity, Mr. Duxbury has, in the new patent machine which I am about to describe, overcome them all. He has adopted with great propriety the rotary motion, as this gives a *continuous*, smooth, uniformly-progressing onward cut, without ridges; and his method of extending the skin upon a surface adapted to receive the edge of such a knife is peculiarly happy. This surface is formed of a cylinder with its circular sides hollowed out, or curved inwards. A reference to the accompanying will I trust render the construction of this machine clear.

The wheel A, 17 feet in diameter, is composed of wood, strengthened by iron arms; its axle works in plummer blocks, bolted upon a strong timber framing, II. On the periphery of this wheel are fixed 25 thin plates of steel, ground to a good edge, and so closely fitted as to form a complete circular knife projecting a short distance, horizontally, from the side of the wheel; the line formed by the edge of the knife being perpendicular with the centre of the toothed wheel L L, figs. 1. and 2.; and on the axis of which, also, is placed the cylinder (if I may be allowed the term) E, fig. 1. This cylinder is composed of wood strengthened by circular irons, &c., in the interior. On the surface of the cylinder a longitudinal opening is cut, for the purpose of wedging in the skin, shown at F, fig. 1. The skin is preserved, properly extended by the cast iron frame, F, called by the patentee, the governor. Fig. 3. shows the construction of the governor to a larger scale, which can be raised or lowered by the lever K K, figs. 1. and 2., by a chain attached for that purpose: it also has iron frames or guides on the upright posts of the framing, for adjusting it as may be required. The skin as it is cut, or split, passes through the opening, H, in the governor, and from thence on to the roller, G, fig. 4., where it is wound off. To give motion to the machine, a strap or band is passed round the drum, B, fig. 2.; this gives motion to the axis, on which is placed another drum, C, fig. 2., and round which a band passes to the

wheel, D D, fig. 1. and 2, On the axis of this last wheel is placed the endless screw, M, fig. 2., taking into the toothed wheel, L, that is fixed on the axis of the hollow cylinder, E, thus giving motion to the whole.

Fig. 4. shows an arrangement for cutting smaller skins, two or three of which, according to their size, may be cut at one time. Fig. 5. shows another form of governor, in case the cylinder should by any means be unequal on its surface. It consists of several pieces of metal hanging loosely on a bar, so that by their own gravity they would press down upon the unequal parts of the cylinder, and preserve the skin perfectly smooth. Fig. 6. is a side elevation, or section, of one of these pieces.

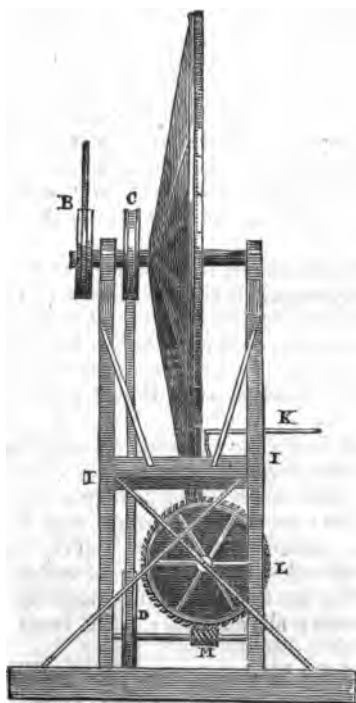
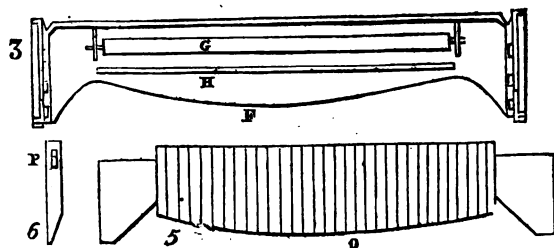
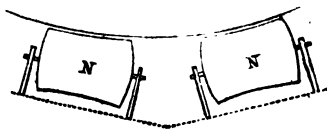


Fig. 4.



THE SIDEROSCOPE,

By which the presence of very minute quantities of Iron may be detected.

An instrument has been invented in France, to which the above name has been given, provisionally, from the extreme facility and delicacy with which it indicates the smallest portion of iron in any substance—mineral, vegetable, or animal.

It consists briefly, of a small straw, nine inches long, through one end of which pass at right angles, two fine sewing needles, sixteen lines in length, both strongly magnetized, weighing only one grain. They are inserted in contrary directions. Through the other end passes a single sewing needle, of the same length, weighing a grain and a half, magnetized in the same manner. This instrument is suspended inside of a glass case, by a single untwisted fibre of raw silk, twelve inches long; substances to be examined are introduced into the case, by a lateral opening. The whole instrument weighs but four grains, and the utmost care is observed to exclude from the frame or table of wood which supports it, the smallest particle of iron, and to avoid the disturbing effects of a current of air, and even of the breath.—The substances to be presented for trial are pasted to a small strip of card or pasteboard, to avoid the heat of the hand or fingers.

Almost every piece of money, French or foreign, ancient or modern, gold, silver, or copper, but especially the silver coins of Italy, attracts the Sideroscope with greater or less activity: it is the same with all substances, mineral, vegetable, or animal, which contain the least atom of iron, nickel, or cobalt. Platina exercises a decided action, notwithstanding all the chemical operations necessary to bring it to a soft state.

Small masses of any of the following substances, weighing at most eight or ten grains, affect this delicate instrument. All kinds of ashes, compacted by a little gum water; blood, simply dried or swelled; chocolate; bottle glass; tourmalines, green and black, not rubbed or warmed; granite; rhomboidal quartz; yellow topaz; green talc; sulphate of iron; all volcanic products; all metals not chemically pure; brass pins, even the finest used by entomologists; various galenas and other minerals; all ærolites; burnt hoofs and horns of cattle, &c.

The most surprising effect of the Sideroscope is, the *repulsion* of the needle by bismuth and antimony.—*Ferrussac's Bull. Juillet, '27.*

**AMERICAN PATENT FOR AN IMPROVEMENT IN THE
MODE OF MAKING WIRE HARNESS FOR WHAVING.**

By EZRA BROWN, Cazenovia, Madison county, New York, Oct. 30, 1828.

WHEREAS, in the original harness, each heddle is formed of two pieces of wire, usually between Nos. 24 and 27, each about ten inches in length, and formed into a staple, by being bent in the

centre, the prongs brought parallel at about one-sixteenth of an inch distant from each other, each end turned inward till it forms three-fourths of a circle, and is brought against the wire, and at right angles with it, forming an eye nearly round, and of a size that would easily admit a rod of the size of No. 12 wire, which rod supports the heddles by being attached to the shaft. In one of these loops, an eye is formed, about three-eighths of an inch in length, and one-sixteenth of an inch in breadth, by twisting the prongs together in a close manner, once and three-fourths round, which places the eye in the proper position to receive the thread by which it is occupied. This is called the eye part, and the other the loop part of the heddle. The loop is put through the eye, and each part extended to its respective rod and shaft.

In the improved harness, each heddle is formed of two pieces of wire bent in the same form as in the original, with the following exceptions and difference. Where the loops are bent in the centre, the prongs are brought parallel, and so close as barely to admit a wire of the same size. In one of these loops, two eyes are formed in succession, the first by twisting the prongs together closely once and a half round, leaving an eye about one-fourth of an inch in length, and in breadth barely sufficient to admit the loop by which it is occupied; the same prongs are again twisted together closely, once and three-fourths round, forming the second eye between this and the first twist, about three-eighths of an inch in length, and one-sixteenth of an inch in breadth, or of such other dimensions as the nature of the weaving and general convenience require. This last eye is occupied by the thread. When twisted as above, both eyes range in the same and in the proper direction. The eye part is made about an inch longer than the loop, by which means the eye that is occupied by the thread is situated nearly at an equal distance from each shaft. In each part the prongs are prevented from separating apart, by twisting them around each other in a slack manner between the eyes and either shaft.

The signal advantage of this improvement is, that the eye which is occupied by the thread, is not encumbered by the interlocking of the loop, whereas, in the original, the thread is evidently exposed, and frequently broken, by getting fastened between the wires where they lock together.

**AMERICAN PATENT FOR AN IMPROVEMENT ON A
MACHINE FOR CASTING PRINTING TYPES.**

By GEORGE F. PETERSON, New York, Oct. 13, 1828.

THIS improvement in Johnson's type-machine, varies from all others, in the following particulars.

1st. In applying a spiral spring instead of a weight, for the purpose of forcing the plunger downwards.

2d. In having separate chambers in the bottom of the pot, one larger, for the plunger to work in, the other for the stopper-rod.

3d. In having the cap suspended under the pot, on a frame, for the purpose of letting the same rise, and fall, in a position parallel with the top of the mould.

4th. In applying a spiral spring fixed on the connecting rod of the stopper, for the purpose of raising the same, on the lower end of the stopper-rod is a stirrup, surrounding a wheel with an indentation; a pin is fixed in the bottom of the stirrup, falls into this indentation at every revolution of the axis, when the mould is brought up against the spout, thereby permitting the stopper to be raised while the metal is forced into the mould.

5th. In using a perpendicular movement, by which the mould is drawn from the spout, and kept in a horizontal position, which is obtained by means of a sliding frame, in which the mould-bed is hung. To the sliding frame is attached a perpendicular rod, on which plays a slide, to which is joined a shackle bar, passing obliquely, and connected to the end of the mould-bed, next the mould; the slide and perpendicular rod, are put in motion by the main lever. The sliding frame is raised when the mould-bed has attained a horizontal position, by the slide on the perpendicular rod striking a fixed collar, and is brought down again by a lever connected with the collar, by an arm on the axis.

6th. The permanent frame in which the sliding frame moves, is fastened on a circular plate, through which, and the permanent frame, the perpendicular passes.

7th. The improvement in opening and closing the mould, consists in using a spiral spring, to give pliancy, so that the mould may accommodate itself to different thicknesses of matrixes, which is obtained in the following manner. Two cylinders are placed on the mould-bed, one within the other; through the inner one passes a rod surrounded by a spiral spring. The rod is continued out at both ends of the cylinders. The outer cylinder is slit, exposing to view the inner one, which is connected to a lever by a rod having two regulating nuts. To the end of the rod next the mould, is fixed a plate which is attached to the back of the moving half of the mould, but borne off by an intervening spring, to give pliancy to the mould—through the fixed plate is a regulating screw, operating on one end of the intervening spring.

8th. The permanent side of the mould is fastened to a shank, which is hollow, to afford a passage for water.

CULTIVATION OF BEET ROOT FOR THE MANUFACTURE OF SUGAR.

THE manufacture of sugar from beet-root, which was introduced into France by Napoleon in 1811 and 1812, has never been abandoned, notwithstanding the many disadvantages under which it has laboured, and especially that of competition with West India sugar,

on the return to the market of that commodity, after the termination of the war. Several patriotic men of science, and noblemen, have continued to carry it on and promote it under the most favourable circumstances, and without regard to profit, from the persuasion that it would ultimately prove beneficial to their country. Among these may be mentioned, Count Chaptal, the Duke of Ragusa; General Preval, Count Danvemet, Count Moncabrie, M. de Serilly, M. de Dombasle, M. Crespel Delisse. M. Dubrunfaut, in his examination before a committee appointed to report on the manufactures and commerce of France, estimates the number of sugar manufactories in France, at nearly one hundred, and the quantity of sugar made yearly at five millions of kilogrammes, or 4921 tons, 11 cwt. 1qr. While the price of refined sugar at Paris is about 2 francs 40 centimes per kilogramme, or $11\frac{1}{4}$ d. sterling per English avoirdupois pound weight, the manufacture of beet-root sugar is profitable, it is rapidly increasing, occupies above five-and-twenty large sugar manufactories in Picardy alone, besides others in the Netherlands, and in various parts of the Continent; and it is estimated, by well-informed French people, that one-half of all the sugar consumed in the city of Paris, and one-eleventh of the total quantity consumed in France is home made beet-root sugar. In the departments of the Somme and of the Pas de Calais alone, there are above twenty establishments on a large scale making sugar. The cultivation of beet-root by the small proprietors of land, for sale to the sugar makers, is a regular and common branch of husbandry; and in those departments, it is asserted, sugar is not only made on the large scale by the manufacturers, but by the housewife of the farm-house, as a matter of domestic economy, requiring not more skill or trouble than cheese making or brewing. The beet-root sugar makers on the large scale refine their sugars, therefore, and produce sugar which for whiteness and beauty, is unequalled by the refined sugar we produce from the West India raw or Muscavado sugar. Bulk for bulk however the refined West India sugar is sweeter than the refined beet-root sugar; but weight for weight, the two are equally sweet. From five to seven per cent. of raw or Muscavado sugar, appears to be the usual produce from a given weight of this raw sugar, forty per cent. of the finest white refined sugar, with fifteen per cent. of inferior refined sugar appears to be the quantities produced; making about two pounds and four-fifths of a pound weight of the finest refined sugar from each hundred pounds weight of raw beet-roots. The pulp from which the juice is extracted, and the other residue of the manufacture, are used for feeding cattle, and form a very important item in the returns of profit. According to M. Chaptal, the value of the molasses, pulp, &c., is sufficient to cover one-fourth of the manufacture. It is not the least promising feature of the manufacture, in the eyes of those who promise themselves great and extraordinary results from it ultimately, that it is thus linked with the ordinary business of husbandry, that it offers no excessive rate of profit, that it operates upon

a known root cultivated for feeding cattle, and that the farmer, whether he raises beet-root for feeding cattle, or for sale to the sugar-maker, is cultivating a green crop, which in his ordinary rotation of crops, he would at any rate raise on a part of his farm. The discovery of sugar in the roots and plants of the beet-tribe, was discovered by the eminent German chemist, Marcgrave, and by him announced in a memoir read before the Academy of Sciences of Berlin in 1747. From want, probably of experience and practical knowledge, the operations he proposed for extracting and ohrystallizing the saccharine matter of beet-root, were too expensive and dilatory to be successful. M. Achard, of Berlin, resumed the experiments of Marcgrave, and was the first who showed that beet-root sugar might be manufactured on a large scale with advantage.

PATENT CARTRIDGES.

By E. J. ORSON, of Princes-street, Finsbury, 1822.

THIS is an improved cartridge for sporting purposes, consisting of a cylinder for containing the charge of shot in the fowling-piece, made of card or strong paper, with longitudinal slits, through which the shot is prevented from passing till the piece is discharged, by a covering of thin paper, pasted on the exterior, and by a circular wadding of card placed in each end of the cylinder. The intention of this patent is to prevent the shot from being too much scattered, or thrown in clusters before they reach their destination.

PATENT NAIL MAKING APPARATUS.

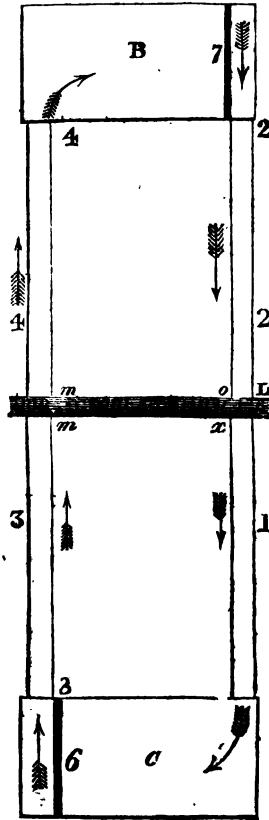
By EDWARD HANCORNE, of Skinner Street, London, 1829.

THIS invention, which is the communication of a foreigner residing abroad, consists in a machine made of two horizontal frames, the one moveable and the other fixed; an axis with a crank, a cam, a fly-wheel, and drum. The bearings of the axis are attached to the lower or fixed frame; and the crank is connected with, and causes the upper or moveable frame to traverse in grooved guides on the lower. From an iron rod, of an appropriate size, placed hot into the machine, a piece, the size required for a nail, is cut off by cutting edges, brought together by the motion of the upper frame; and held between two steels while the head of the nail is formed by the action of a kind of hammer, whose face is shaped like a die into the form required, and whose stem is acted upon by a kind of cam upon the axis. The nail is then to be tapered or pointed by the action of two eccentric steel sectors, whose circular surfaces are placed, at the commencement of the operation, sufficiently apart to receive the thickest portion of the nail, and at the termination of the operation, when they are brought by the motion of the upper frame into a position with the point of contact, nearly in a line between the centres of motion, they deliver the nail with a fine flat tapering point.

UDNY'S PATENT STEAM REVOLVING ENGINE.

Communicated by the Inventor, Dr. UDNY, of Arbour Terrace, Commercial Road.

THIS operates by the gravity of a fluid, or metal that is fusible, at the boiling point, acting on the circumference of a wheel, and which is propelled from one vessel at or near the bottom of the said wheel, by the power of steam, into another vessel at the top, in the following manner :—



In the figure is an axle, or gudgeon, which must be fixed : at one end it is hollow up to the inside nave, where the wheel revolves, which hollow is divided into two. The mouth of one of those openings points upwards, and the other downwards ; or two pipes run into this axle as far as *o* and *x* : the first being from the condenser, or atmosphere, and the second, *x*, from the boiler. In another part of this axle, at *m*, a perforation runs through the axle. On this

axle, or gudgeon, is strung a double wheel, which rotates freely on it: one of the naves of said wheel being over the mouth of the holes *o* and *x*, and the other revolving at *m*. This double wheel has cylinders (any number) placed between its side at the circumference, every two being opposite: the ends of these cylinders being at the internal part of the rim of each wheel, as B and C. In them may be pistons, as 1 and 2. Pipes, which may be the arms or spokes of the wheel, are to run from one cylinder to the other, at each end of said cylinders; and thus each radius will be alternately the steam pipe and the eduction one, as it comes to the pipe over the axle marked *o*, to the condenser under the hole marked *x*, the mouth of the pipe to the boiler. No valves will be necessary, but a cock, to shut off the steam from the axle when wished.

Now, suppose C to have come to the bottom full of fluid, the gravity of which will have turned the wheel into the now imagined position. The pipe 1. will then present its opening to the mouth of the pipe in the axle, *x*, leading from the boiler; while the mouth of the pipe 2. will be in contact with the mouth of the pipe *o*, in the axle, leading to the condenser. A vacuum will therefore exist on one side of the piston 7. in B, and the steam will pour into C, in the direction of the arrow behind its piston 6. forcing it along, and propelling the fluid on the other side of it, up the pipes 3. and 4. into B. When B comes to the bottom, the reverse will take place; 2. will be opposite the mouth of the steam-pipe, *x*, and 1. the eduction one, *o*. The steam will flow into B, and the fluid be propelled from it up to C, and so on.

PATENT IMPROVEMENT IN SPINNING.

By J. RHODES, Jun. of Alverthorp, near Wakefield, 1829.

THESE improvements embrace a variety of machinery for spinning and twisting cotton yarn, and other fibrous substances, in which a heart motion is employed to cause the bobbins to traverse in their spindles in such a manner as to wind the thread evenly upon them; and by which, when the bobbins are full, the train of levers can be detached from the heart, and the bobbins be permitted to descend clear of the spindles, which are placed with their points downwards, and are removed and replaced by empty ones with great facility.

PATENT MODE OF CLEARING WATER-COURSES.

By Professor W. FARISH, of the University, Cambridge, 1829.

MR. FARISH'S method is to detain the water which has to pass through any sewer or drain, in a tank or other appropriate vessel, until it accumulates and rises to a certain elevation, when it is made to disengage itself by opening a sluice, or other contrivance, and empty itself instantaneously, and thus wash away any deposit which

may have been left in the drain or course. The patentee describes two mechanical contrivances for effecting the instantaneous discharge of the water, but he does not claim either, as he states that any method best suited to the localities of the drain may be used.

This patent appears to us a most singular one, the principle of it being almost universally adopted, and very probably from time immemorial. Water-courses have even been constructed with apparatus for producing this very effect. The worthy Professor, buried in the cloisters of the University, has possibly had but few opportunities of observing what takes place out of it.

PATENT SEALING WAX.

By **PETER RISLEY WASON**, Esq. of the Middle Temple, 1829.

This invention consists in the introduction of a small wick of straw, or any other suitable material, into the stick of wax, which is to be made of equal parts of shell-lac, vermilion, and Venice turpentine; which are to be melted together over a slow fire, formed into pieces by rolling a portion on a hot copper-plate. A longitudinal notch is then to be made in the stick to receive the wick, which being introduced, the stick of wax is to be rolled into a cylindrical form on the hot plate or shaped into any other form by being pressed into a mould, and stamped with any required impression. The patentee does not claim the method of manufacturing the sealing-wax which he has described, but simply the introduction of the wick to render it more convenient in application.

PATENT FILTERING APPARATUS.

By **W. BELL**, of Lucas-street, Commercial Road, 1829.

THE great fuss made lately about the impurities of the Thames water, has raised up a host of patentees, all panting for the honour of supplying us with chrystal fountains. In their over-eagerness for fame and fortune, they have invented over and over again, what has been done a million of times before. Mr. Bell's invention is described in his specification as consisting in admitting the water to be filtered from the cistern or reservoir, situated higher than the filtering apparatus, at the bottom of the filter, and causing it to pass upwards through several strata of hair cloth, ground cinders, or coke, and sand of different degrees of fineness: the lower stratum of the cinders, &c. and the upper strata of the sand being the coarsest. In order to clean the apparatus, the patentee proposes to let in the water from the cistern above each stratum, and to let it out at the bottom of the filter, to wash the sediment from the different strata of the filter as it descends.

MISCELLANEOUS INTELLIGENCE.

COAST LIGHTS ON A NEW PRINCIPLE.—In a paper published in the last number of *The United Service Journal*, Mr. Martin, the celebrated painter, details the particulars of a method invented by him, of guiding vessels by night as well as by day, through the shoals which beset the English coast, by means of suspended light-towers. Mr. Martin recommends that after ascertaining by boring the depth of the sand, a broad triangular foundation shall be laid in the following manner, as described by himself:—The material of the foundation, to be hollow metal boxes, each furnished at one end with two projecting portions (and at the other with two corresponding holes, so that each box may be firmly locked into that on either side of it; the boxes are hollow, that they may be more easily managed by the workmen, and are less expensive, but they will be sufficiently heavy, because each box, as it sinks, will be immediately filled with sand. One hollow triangular layer of these boxes, thus inseparably locked in each other, must, in the interval of one low tide, be deposited upon the sand. This layer will have sunk to a certain depth at the ebbing of the next tide, when another triangular layer of these boxes must be dropped upon the first. This additional weight would cause the first layer to sink still deeper. And over these, at a very low tide, fresh layers of boxes must be sunk, until the lowest has reached the firm sand, or other substance, and will sink no further. Into every hollow box as it descended, the sand would enter: it would also completely fill the hollow triangular foundation, and being protected by it from any external influence, would add to its stability. When so many layers of boxes have been sunken that the upper layer lies within three or four feet of the surface of the sand, and will not sink further, the foundation would be completed. A light-tower, circular in form, as that least likely to be affected by the influence of the winds and waves, about ten feet in diameter, might then be suspended from the junction of three wrought-iron legs, inserted into the foundation, and strongly united at their apex, thus assuming the form of a pyramid, with an equilateral triangular base. Upon rocks lying beneath the water, the hanging tower could be adopted with still greater advantage. In such a situation the triangular frame, or foundation, would not be necessary, as the legs of the triangle could be fixed firmly into the rock.

MANIFOLD PROPERTIES OF THE ELDER TREE.—The elder tree, (says Miss Kent, in an article in the *Magazine of Natural History*.) does as much good by its noxious as by its agreeable qualities. If corn or other vegetables be smartly whipped with the branches, they will communicate a sufficient portion of this scent to keep off the insects by which so many plants are blighted. An infusion of the leaves, poured over plants, will preserve them from caterpillars also. The wine made from the berries is well known; but, perhaps

it may not be so generally known that the buds make an excellent pickle. A water distilled from the flowers, rivals butter-milk itself as a rural cosmetic. In some remote country places it supplies the place both of the surgeon and the druggist: it furnishes ointments, infusions, and decoctions for all ailments, cuts, or bruises. Every part of it serves some useful purpose—the wood, pith, bark, leaves, buds, flowers, and fruit. Its narcotic scent makes it unwholesome to sleep under its shade.

NEW MODE OF VACCINATING.—In the hope of rendering vaccination a more certain preservative against the attacks of small pox, Mr. Jahn vaccinates his patients on the thighs as well as the arms, in such a manner as to produce from 24 to 36 pustules. The fever which succeeds to this operation is represented as very strong, but as never having been attended with grave or dangerous symptoms.—*Archiv für medicin. Erfahrung.*

FRENCH SOCIETY OF DOMESTIC ECONOMY AND MECHANICAL ARTS.—A society is proposed to be formed in Paris, under the title of "Society of Domestic and Manufacturing Economy," with a view to encourage experiments, to collect facts and proceedings relating to domestic economy and the mechanical arts, and to publish them in a journal. The price of the subscription to be twenty-five francs a year, and every one of the subscribers will receive the journal, to appear every three months, without any further demand. Persons of both sexes are invited to contribute the aid of their talents and purses.—*Bull. Univ.*

POTATO SUGAR OBTAINED, CHRYSTALLIZED.—M. J. B. Mollerat, of Pouilly-sur-Saone, the proprietor of a manufacture of chemical products, has lately shown to strangers and merchants who have visited his establishment, potato sugar in chrystals, decidedly formed, and perfectly resembling very white sugar-candy.—*Ibid.*

TRADE IN COFFEE AT ANTWERP.—In 1828, Antwerp received 362,073 bales, and 5008 rundlets and hogsheads of coffee: the sales amounted to 341,120 bales, and 3330 hogsheads and rundlets. The supply at the beginning of the present year was 145,000 bales, and 300 hogsheads: on the 31st of December, 1827, the town possessed 140,000 bales, and 500 hogsheads.—*Journal du Commerce.*

STUDY OF NATIONAL ANTIQUITIES IN RUSSIA.—The Russian Imperial Academy of Sciences has set on foot an archæological tour of exploration throughout Russia, under the direction of M. Stroeck.

CURIOUS FACT IN THE ECONOMY OF BEES.—M. de Jonas de Gelien, pastor of the churches of Colombier and Auvernier, in the principality of Neuchâtel, Switzerland, in a work translated into English, under the title of 'The Bee Preserver; or, Practical Directions for Preserving and Renewing Hives, affirms a very important and singular fact with regard to the economy of bees. It is, that when two or three distinct hives are united in autumn, they are found to consume together scarcely more honey during the winter than each of them would have consumed singly, if left separate. In proof of this remarkable result, the author states a variety of expe-

riments to which he had recourse, and all of which led uniformly to the same conclusion. And, indeed, he shows positively, by a reference to upwards of thirty hives, six of which had their population thus doubled, that the latter do not consume more provisions during winter than a single hive does ; and that, so far from the bees suffering from this, the doubled hives generally send forth the earliest and best swarms.

EFFECTS OF FRESH WATER ON MARINE ANIMALS.—The Magazine of Natural History, of May, opens with a curious and interesting paper on the remarkable effects produced by fresh water on certain marine animals and plants, which has been lately read to the Belfast Society of Natural History by Dr. Drummond. Among other objects, experiments on which were detailed by Dr. D., was the white worm, or lurg, or lurgan, the *Nereis coerulea* of Linnæus, a number of specimens of this animal lay on a plate, and were motionless. The Doctor dipped his hand in fresh water, and with a jerk sprinkled some drops of it over the plate, and the specimens on it. In about two seconds the worms were all in violent agitation, rolling round on the longitudinal axis of their bodies, and writhing together in apparent agonies. After a few minutes the agitation ceased, and they again lay motionless. He then tried the effect of touching an individual with a small drop of fresh water. The part to which the latter was applied, almost immediately contracted in the manner that a leech contracts at the place where a little salt is applied to it, and then the whole animal became agitated, and dashed violently about the plate, frequently, at the same time, protruding and contracting its proboscis. Other trials were made, and followed by similar effects : it mattered not what part of the animal was touched. The smallest drop of water from the point of a probe produced the partial contraction at the part, and then the general convulsive writhing and agitation of the whole body. Even fragments of the worm were similarly affected. It appeared, however, that the mouth extremity was more sensible to the touch of the poison than any other part, as the convulsive efforts which followed seemed more violent, and longer continued, than when the water was applied elsewhere. As the most striking way of exemplifying the virulent effects of fresh water, Dr. Drummond recommends, when the worm is at rest, to apply consecutively from the point of a probe, ten or a dozen small drops of *sea water* to any part of it : this causes no alteration ; the animal continues motionless. If we then change the drop to be applied from salt to fresh, the very first application of the latter immediately produces the phenomena above described.

NEW BARK FOR TANNING.—A tanner of Bern-Castel, on the Moselle, named Rapedius, has discovered a new species of tan, adapted for the preparation of leather. This is no other than the myrtle (*vaccinium myrtillus*.) It is to be gathered in the spring rather than at any other season, because it then dries sooner, and is more easily ground. Three pounds and a half of this tan is sufficient

to tan the same quantity of leather which it would require six pounds of tan to produce. By the new process, it is said tanners may gain four months on the time necessary for the manufacture of strong leathers. A commission appointed at Treves for the examination of leather so tanned, have reported that they never before saw any article equal to it; that a pair of shoes made from it would last two months longer than those in which common leather was used; that the skin of the neck, which is generally difficult to be worked, when dressed with this tan, becomes at the same time as strong and elastic as the other parts. The myrtle should not be torn up by the roots, but cut with a bill, in order to obtain the reproduction of the plant in the following year. When cut, damp does no injury to the tan, which is not the case of the tan of oak, which loses ten per cent. of its value by being wetted.—*Kunst und Gewerbeblatt*.

ROMAN THEATRE AT ORANGE IN FRANCE.—A plan is in agitation for repairing and preserving the theatre at Orange, and converting it to modern uses, not incompatible with the preservation of the ancient form of the construction. This is known to be one of the most important of the Roman monuments remaining, not only in France, but even in Italy. In dimensions it exceeded the theatre of Marcellus at Rome, and like that monument, has been used for domestic purposes, and converted into dwellings. The northern side is still in a fine state of preservation, and is composed of arcades, ornamented with pilasters. Many of the stairs and dormitories, and of the chambers called by the ancients *hospitalia*, are still existing. It is proposed, if a slight aid can be procured by the government, by the contributions of the rich of the department, to lay open the orchestra, a labour which it is expected will be remunerated by the antiquities and articles of value to be found there. When the repairs are finished, the edifice will be assigned as a site for holding the fairs and markets of the town.—*Bull. Univ.*

FRENCH STATUTES OF ARCHERY.—A little pamphlet has lately appeared in France, containing the statutes and general rules for all companies of the noble sport of the bow, and confraternities of Saint Sebastian, in the kingdom of France. These ancient statutes consist of 70 articles. The Abbé de Saint Médard les Soissons is the grand master of the order of archery; and in his absence the reverend father, the grand prior of the same abbey, acts as his deputy, with the title of vicar general. The statutes are obligatory throughout France. They are the charter of the knights of the noble science; nobody could be admitted knight unless he were *catholique apostolique romain*.—*London Mag.*

MODE OF DISCOVERING IF STONES WILL RESIST FROST.—M. Brard, in the *Annales de Chimie et de Physique*, recommends a process for quickly discovering whether stones will support frost. This process consists of boiling in water, saturated cold with sulphate of soda, samples, cut into cubes, of the stones which are required to be proved. After half an hour's boiling, the cubes are to be taken out of the water, and suspended separately over small vases

filled with the solution in which they have been boiled, and which should not contain in suspension any foreign matter. At the expiration of 24 hours the cubes will be covered with a saline efflorescence; they should then be dipped in the liquid several times. The stones liable to be injured by frost experience a very sensible alteration; they leave fragments behind them in the liquid; the cubes lose their angles and sharp edges. In this way a comparison may be made of divers descriptions of stones. The operation is entirely effected in the course of five days.

LIST OF NEW PATENTS SEALED.

"HUMAN SNARE."—To Mr. Madeley, of Yardley, Worcester, for a machine for detecting and detaining depredators and trespassers, or any animal, which he denominates the *human snare*. Sealed 28th March, specification to be inrolled in two months.

IRON MANUFACTURE.—To Josias Lambert, of Liverpool-street, London, for improvements in the smelting and other processes in making bar iron. 30th March. Four months.

RIGGING.—To Mr. Prior, of Albany-road, Camberwell, for improvements in the machinery for securing, supporting, and striking top-masts. 11th April. Six months.

RUDDERS.—To Captain John Lihou, of Guernsey, for an improved method of constructing the pintles for hanging rudders. 14th April. Six months.

WAREHOUSES.—To H. R. Palmer, Esq. of the London Docks, for improvements in the construction of warehouses, and similar buildings. 28th April. Two months.

CALICO-PRINTING.—To Benjamin Cook, of Birmingham, for an improved method of making metallic cylinders for calico-printing. 23d April. Six months.

CONDENSING GAS.—To James Wright, of Newcastle-upon-Tyne, for improvements in condensing the gases produced by the decomposition of muriate of soda, &c. 28th April. Six Months.

POWER ENGINE.—To Peter Pickering, of Dantzic, and Wm. Pickering of Liverpool, for an engine to be worked by fluids or gases, to be denominated Pickering's Engine. 28th April. Six months.

SUGAR REFINING.—To John Davis, of Leman-street, Middlesex, for improvements in the condensing apparatus used for boiling sugar in vacuo. 28th April. Six months.

SPINNING.—To Geo. W. Lee, of Bagnio-court, Newgate-street, London, for improvements in the machinery for spinning cotton and other fibrous substances. 2nd May. Six months.

EMBROIDERY.—To Henry Bock, of Ludgate-hill, for improvements in machinery for embroidering and ornamenting cloths, &c. 2nd May. Six months.

PROPELLING.—To James Dutton, Jun., of Wootten-under-Edge, Gloucester, for an improvement in propelling vessels. 19th May. Six months.

TO CORRESPONDENTS.

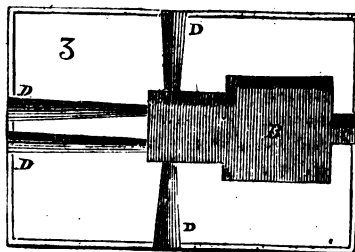
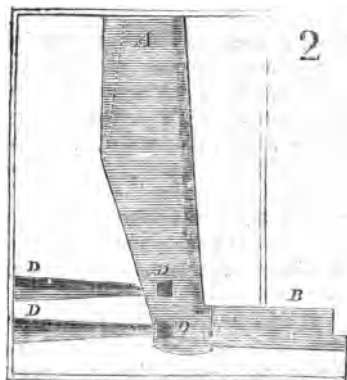
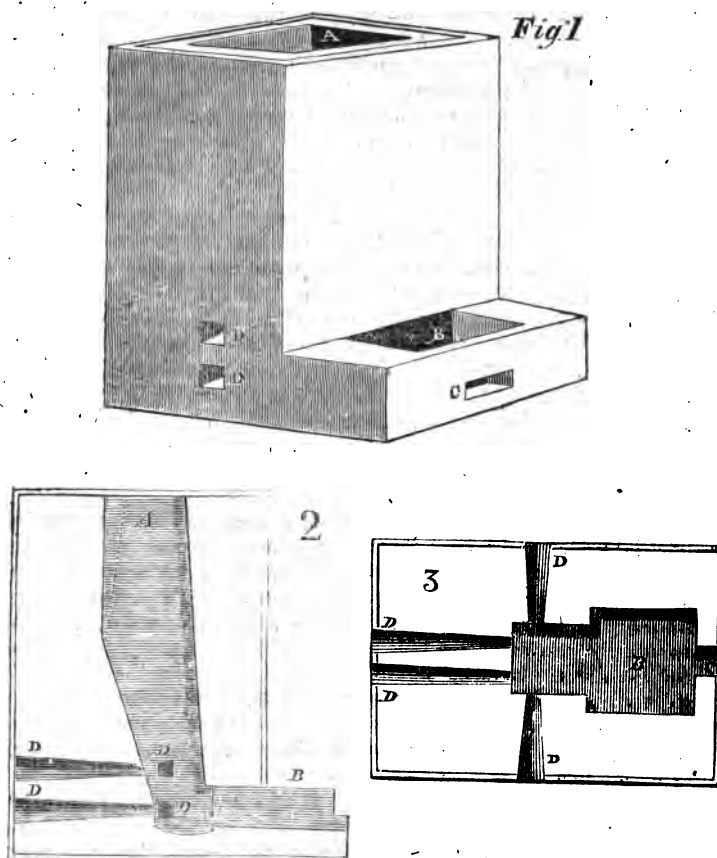
Mr. Thomas's favour will be attended to.

In reply to Mr. Hall, we shall have no objection to publish Mr. Mason's lecture in a condensed form.

The patent mentioned by W. S. is intended for an early notice.

The stove proposed by A. S. W. would be found too inconvenient to replenish.

The description of the *Maison d'Epines* is intended for insertion.



AMERICAN PATENT FOR AN IMPROVEMENT IN THE MANUFACTURE OF MALLEABLE IRON, AND OF AN IMPROVED BLOOMERY FURNACE.

By BENJAMIN B. HOWELL, Philadelphia, November-6, 1828.

THE discovery consists of an improvement in the construction of the bloomery furnace,* by means of which, and the use (in the manner hereinafter described,) of anthracite coal, exclusively, for fuel, iron ore is directly converted into malleable iron.

The drawings exhibit an elevation, and vertical and horizontal sections. By these, and the notes and references appended thereto, it will be seen that this furnace combines within itself, the advantages of both a close furnace and an open fire; in this respect differing, essentially, from any other now in use for similar objects.

* Bloomery is here used in the sense commonly understood in this country.
VOL. III.—NO. 71. 2 A 19 JUNE, 1829.

In the upper, or close portion, being all that above the earth, with anthracite coal excited by a proper blast, a degree of heat is obtained much greater than can possibly be generated in the ordinary fire with charcoal; while the lower portion opening into the hearth, and permitting the free action of blast upon the burthen, performs all the offices of the open fire, or forge. The size of the furnace and the proportions may be varied, if the principle of the close and open fire be retained.

The furnace being first heated up in the manner of a common cupola, the process is thus conducted. The coal having settled sufficiently for that purpose, it is charged with the proper burthen of ore, which will vary according to the quality and kind. The charges are then continued, alternately of coal and ore. The ore soon arrives at the tuyeres in a state of partial fusion, and is then, by the intense heat of that part of the furnace, quickly separated from its earths, and then rapidly descending into, and below the direct action of, the blast, a large part of which is driven out at the open front, first passing over that portion of the ore which has reached the hearth, it is thereby brought, in the language of the workmen, "to nature," or, in other words, into malleable iron.

As it sinks into the region of the blast, the small masses may be driven into one, and a loup shaped by giving a proper direction to the pipes at the different tuyeres, and the loup can be removed with a proper instrument, another instrument, or strong iron bars, being introduced at B, to hold up the burthen while this is doing. The loup may be drawn into a bloom under a forge-hammer, or passed through rollers. In either operation it will, of course, be necessary to renew the heats, which may be done in a common chaffery, or in a heating furnace. This process is continued at the pleasure of the workmen, and as soon as a quantity sufficient for a loup accumulates, it is withdrawn, as above described.

In the early stage of the operation it will be necessary to charge the furnace nearly, or quite, to the top; but, as the heat increases, the height of the coal may be gradually diminished, and at a very high temperature, from two to three feet of coal will be found sufficient.

The cinder produced in this way will, in all respects, resemble forge, or bloomery cinder, and will bear working a second time; an appropriate flue facilitates the operation, and as it is first fused, and sinks, and is thus interposed between the iron at the bottom of the hearth, and the coal, it contributes to prevent a mixture of the two.

Holes may, or may not, be left in the sides of the furnace for the introduction of bars to aid in detaching the iron from the bottom and sides; but this will not often be necessary, if the back of the furnace be thrown sufficiently forward, and a proper direction be given to the blast; for which purpose tuyeres are placed in different positions on three sides of the furnace, and at different elevations. One or two pipes may be used at pleasure.

From the foregoing, it must be obvious that by the rapidity of the process, the saving thereby of time and labour, the substitution of a cheaper, more powerful, and abundant fuel, for that now in use, and which is so made applicable to this object, by the peculiar construction of this furnace, that a great and important improvement has been effected in the conversion of iron ore into malleable iron.

Notes and References for the Improved Bloomery Furnace.

The drawings, figs. 1, 2, and 3, represent an elevation, and vertical and horizontal sections, all drawn upon a scale of three feet to an inch, and the same letters refer to the corresponding parts of each.

A.—Trundle head where the furnace is charged; to be provided with a cover, which is placed on in the intervals of charging, when the coal is low.

B.—Projecting, open, hollow hearth, for the reception of cinder and iron, with a cinder hole at C, to be opened when it is wished to draw off the cinder.

D D.—Tuyeres, for the introduction of the blast, placed in different positions on three sides of the furnace, and at different elevations, to vary the direction of the blast at different stages of the process.

The back and front in-walls may both, or either, be thrown or inclined somewhat more inward than is represented in the drawing, and as indicated by the dotted lines in the vertical section; and with advantage when the ore is not very pure, and makes much cinder.

The furnace should have over it a brick canopy, or a chimney, to aid in giving a direction to the gas given out by the coal, which is distressing to the workmen if largely diffused immediately around it.

The furnace should be lined with fire brick, and cased with cast iron plates, secured by strong bolts, keys, and screws, and, between the casing and lining, common brick with a thin packing of sand; the latter, to prevent injury from expansion.

Notes on the foregoing.—In a letter from the patentee, which was received with his application, he observes, "I some time since mentioned to you, that I had then completed some further experiments with anthracite coal, the result of which I should soon communicate to you, and which I thought would both interest and surprise you. The papers which I enclose will explain what these experiments were. They relate to an improvement in the bloomery furnace, and in the conversion of iron ore into malleable iron, with anthracite coal, exclusively. In this, in six different experiments, I completely succeeded, making, in a comparatively short time, perfect bar iron, and, indeed, nails, without suffering it ever to cool. Practical forgemmen, who performed the manual labour, were astonished beyond measure, at the result: it was, indeed, complete in every respect, the iron being as good as that made at the neighbouring forges, in the old way."

"Refining of pig-iron has been attempted in Pennsylvania, but, I believe, abandoned, from the difficulty of preventing a mixture of coal with the iron, in its soft state; this, in my method, is obviated, almost entirely. The process is rapid, and even here, where the coal is high, is economical; how much more must it be so, where coal and ore can be had for digging."

Journal of the Franklin Institute.

REMARKS UPON BLEACHING.

By JUNIUS SMITH, of Liverpool, United States.

THE improvements made in the art of bleaching during the last half century, have, in some measure, conquered the prejudices inseparable from long-established habits; and practical men, though strongly wedded to their own methods of working, and sufficiently jealous of projected improvements, have yielded reluctantly to a conviction of their utility. It is presumed, that the usual method of chemical bleaching as now practised, both in Europe and the United States of America, is too well known to require a particular description. In that method there appears to me to be a fundamental error in the alternate use of hot and cold liquors. It is evident, that a heated solution of alkali opens and expands the fibres of linen submitted to its action, and thus affords an opportunity for the alkali to act upon its colouring matter, and to increase its solubility. But the second step in the ordinary process of bleaching, counteracts the first. The linen is taken *hot* from the bucking tub, and immediately thrown into *cold water*, for the purpose of being washed. The fibres of linen collapse; the colouring matter is condensed, and its affinity for the linen is restored, which is manifestly the reverse of the object intended to be gained by the process.—If the rinsing water be of the same temperature as the alkaline liquor, this reaction is prevented.

2dly. From this washing in cold water, the linen, after having been bucked a sufficient number of times, and exposed for months to the air in the fields, comes, in due course of time, to its second stage of operation.

The linen in large quantities, is immersed in vats of cold chloride of lime, in a quiescent state, and the bleaching properties of the liquor act upon it imperfectly and unequally, in consequence of the dense mass of linen, and the frigidity of the medium through which it has to act.

If the linen were put into the bleaching liquor moderately warmed, confined so as to prevent the escape of gaseous vapours, and then set into regular and constant motion, these objections would be obviated; the effect of the warm liquor would be uniform and active, which can never be the fact while it is cold, and in a state of rest.

What I have remarked concerning the manner of using alkaline and chloruretted liquors, applies with equal truth to the use of acidulated water in the third stage of bleaching.

3dly. The third most important point to be considered in the process of bleaching, is, the degree of heat to which the linen is subjected.

Bleachers are generally sensible of the advantages of heat, and various contrivances have been adopted to apply *steam heat* to the purposes of bleaching. But I am not aware that any one has attempted to bring his goods into *action* in steam heat *under pressure*. Nor do I know that there has ever been any mechanical invention brought into practice, by which it could be done, until my machine was constructed. The French bleachers have taken much pains to use an alkaline solution at a temperature above boiling heat, but without success. They seem to have a correct idea of the probable effect of increments of heat above that degree, but failed in their attempts to reach it through the imperfections of their mechanical inventions.* But I can find no evidence of their ever having conceived an idea of the advantages likely to result from the combined action of *heat* and *motion*.

Unless the steam is brought to act *under pressure*, it is evident that no material benefit is gained by steaming instead of boiling—often the reverse, because the heat will never exceed, and the moment it is exposed to the atmospheric air, will fall below 212° Fahrenheit; or boiling heat. But if the steam is *confined*, it is easy to raise its heat to 230°, and then the effect upon the linen, shows, in the most unequivocal manner, the advantages of augmented heat in bleaching. This effect is not only more strikingly obvious, but is singularly beautiful, when the goods are put in motion, and the degree of bleaching is rendered perfectly uniform.

There can be no danger, as some have apprehended, of injuring the linen by excessive steam heat, because the scorching heat of steam is 520° Fah.—a pressure of fifty atmospheres, a seven hundred and thirty-five pounds upon a square inch—a pressure which no ordinary steam apparatus will resist.

Steam heat at 350° thermometrical measurement, will so far soften soldering, as to cause it to yield to the pressure, and the steam pipes will burst. These are facts which I state as the result of my own repeated experiments, in which I cannot be materially mistaken, and, therefore, I feel justified in saying, that it is not possible, with any ordinary working apparatus, to carry steam to so high a temperature as to injure any goods submitted to its action. By giving motion to the linen, under the reciprocal action of steam heat, under pressure, and alkaline liquor, the effect is not only more powerful than it can be by bucking, but, as already hinted, it is more uniform.

Every part of the cloth is equally exposed to the operation, and the colouring matter detached from the cloth, floats in the liquor below.

This appears to me to determine the question which some have raised, whether the colouring matter of linen is actually detached

* Vide Berthollet on Dying.

from the cloth, or is bleached upon it without being detached? When we find that the loss of weight, in the various methods of bleaching, ranges from twenty to thirty per cent.—and when we find the colouring matter suspended in the liquor, and reducible by evaporation to a mucus, it seems to me that there can be no doubt that the colouring matter is removed—at any rate, a large proportion of it. The repeated experiments which I have made upon a considerable scale in bleaching, clearly demonstrate the utility of combining heat and motion. The action is direct, immediate, and uniform. The strong affinity which unites the colouring, the glutinous, and the oleaginous matter to the fibres of the linen, is weakened and rapidly overcome, and no opportunity is afforded for their subsequent combination.

By this method I have bleached Scotch drills in twelve hours, and Manchester cotton shirtings in four. There will be no occasion to croft cotton goods, but linens receive a clearer and more brilliant white, by exposure upon the grass for a few days.

P. S. I have omitted to notice, that the saving in alkali by this method of bleaching, compared with the usual consumption by the English, Scotch, and Irish bleachers, is about twenty-five per cent.

Silliman's Journal.

PATENT IGNITING APPARATUS.

By SAMUEL JONES, of the Strand, inrolled 1829.

THE inventor of this contrivance is a foreigner residing abroad, who has communicated it to the patentee. It is a kind of little match, one end of which being pressed between the finger and thumb, ignition takes place at the other end, the flame continuing sufficiently long to light a cigar, or seal a letter, as well as for the lighting, as usual, of candles. The method of preparing these little pocket matches, is stated to be as follow:—

Into a globule or other small vessel of glass, either of a spherical, cylindrical, conical, elliptical or angular form, of the size of from one to two inches long, and from a sixteenth to a thirty-second part of an inch in diameter, introduce sulphuric acid, varying the quantity according to the size of the globule or other glass vessel, but so as not completely to fill it; the aperture is then to be hermetically sealed by melting the glass with the assistance of a blow-pipe. The vessel is next to be enclosed or surrounded by the oxymuriate or chlorate of potash, compounded or mixed with some combustible material, such as animal fat, camphor, inflammable gums or resins, sulphur, farinaceous powders, or other readily inflammable substances, made up into a paste with mucilage or water, as may be found convenient, taking notice that the latter do not exceed more than double that of the chlorate of potash. The glass thus surrounded by the combustible paste and potash, is now to be enclosed in paper, linen, or other combustible substance intended to be ignited, which completes the manufacture.

To obtain a light from one of these matches, a slight blow, or pressure sufficient to break the little globule of glass, is to be given, which brings the sulphuric acid in contact with the composition, and produces ignition.

ON FURNACES WHICH CONSUME THEIR OWN SMOKE.

(Continued from p. 330.)

WE have now to submit to our readers the plans employed by Mr. Benjamin Merriman Coombs, for the saving of fuel and burning of smoke, which were presented to the Committee of the House of Commons with the accompanying letter, many of the remarks in which are good, notwithstanding they are delivered with that peculiar quaintness which is characteristic of the Merriman family :—

“ 66, High Holborn, London,
July 2, 1819.

“ SIR—In submitting my plans to the consideration of the Honourable Committee, I beg leave to accompany them with a few remarks, which although not so clear as I could wish, may still tend to elucidate the operations of the apparatus, and of exciting some ingenious artist to correct the existing evils, such as the immense waste of fuel, the inconsistent plan of erecting as also of feeding the fire of steam and other boilers, the obviation of which inconvenience has employed much of my time for upwards of ten years back; and although I have succeeded in some points, yet their remains much more to be done; and so convinced am I of its practicability, that I have looked with the daily expectation of some engineer producing a plan that would embrace completion. Steam-engines are now brought to so high perfection, that there seems nothing scarcely that cannot be performed by them,* and I am of opinion they can be made their own servants, to supply their own fuel, and consume their own smoke,† on different plans; and I would remark a powerful drawback, namely, the door in front for feeding the fire, the removal of which I strongly recommend, well knowing its great mischief—every time the door is opened to supply the fire, thousands of gallons of cold air rush in, striking against the bottoms and sides of the boilers, cooling the flues, and most completely counteracting our grand object, of retaining heat, may I say, equal in effect to almost water. By the usual method of supplying the boiler with fire, the door is opened every five minutes to admit *four* shovels of coals; by this method, out of twelve hours, the door is opened three hours, exposing the boiler and flues, which not only impair and damp the fire, but assists much to force up the virtue of the coals unconsumed. Within the bills of mortality how

* With the opportunities of knowing, Mr. Merriman ought to have known, that any other power can do what steam-engines do. A gentleman was once talking like Mr. Merriman in a coffee-house of the wonders performed by the steam-engine at Whitbread's Brewhouse, when a wag replied, that it did *more*—it not only kept the books, but even *collected* the *bad* debts!—EDIT.

† As we have a mortal hatred to tobacco, will Mr. Merriman have the kindness to recommend to us a servant who consumes his own smoke?

many thousands of chimneys are at this moment emitting into the atmosphere their black and immense volumes, consisting of the strength and virtue of some hundreds of chaldrons of coals. May not this rouse the thinking mind to exert its energies to an application of this smoke, which is no other than an impure gaseous state of coal? The perfection of gas, and its usefulness, which is nightly before our eyes, convinces *me* that the smoke of steam and other boilers may be transmuted into fuel, and to a great extent of saving. Steam-boilers require a strong heat and power to raise the steam to a certain force at first, then to maintain that force, continuing a solid and steady heat without so strong a draft, or, in other words, without the extraordinary waste and consumption of coals.

"With my drawings and model, I will more fully explain it. Brewers' coppers I have found much more difficult, as they must not only have a strong boiling heat, but also power to damp their fire with facility; this sudden change they require twice a day. With the power of moving the body of coals from the boiler, I consider we may, and I am emboldened to say, from late experience and observation, it can be accomplished; by igniting smoke we convert it into fuel. To convey an accurate description with my pen I find difficult, but by a verbal explanation I doubt not to make it evident, the great advantage resulting in forcing the smoke through red-hot cylinders, pipes, or flues for ignition, and also in feeding the fire with hoppers and wheels, or perpendicular, or in an oblique direction. That I may be more fully understood, I have given a section of a coke oven, the process of which has years back convinced me that boilers may be heated on the same principle, and with an extensive saving of time and fuel. Coals, like a corn-field on fire, will communicate its heat and flame from one particle to another, as the currency of air drives it. The arrangement of air into all fires I consider of the utmost consequence, as I am confident that, with care, even our atmospheric air may be considered as fuel. In my specification (1813) I claim the shape of a boiler, standing on an iron pillar at the back; also on a plate of iron: for small boilers it answers; but it is the brewers' coppers that have baffled my efforts till within these three months. I am prepared for many objections to my drawings and plans, but I wish to observe, that I am as willing to assist as be assisted, and

"I remain, Sir, your humble and obedient servant,

"BENJAMIN MERRIMAN COOMBS."

"M. A. Taylor, Esq. M. P.

It does not appear that the Committee of the House of Commons afforded Mr. Coombs the opportunity of a verbal explanation, but his plans were received and printed in their Report. The first-described plan is accompanied with six elaborate engravings, which as they will not suit to transfer to our pages, we shall endeavour to give an idea of the thing represented in a few words.

The coals are put into a large hopper above the furnace, and pass from thence between three iron cylinders (the revolution of which reduces such coals as were too large to pass by) down an *inclined*

plane, falling upon a circular iron plate placed near to the bottom of a cylindrical well or hole which is directly underneath the boiler. This plate is made to slide up and down in the well, (precisely as that described in a recent number as the patented invention of Mr. Cutler) by the action of a toothed rack and pinion. (This contrivance affords the means of readily damping the fire, by depressing the bed of coals, which together with the opening of the furnace-door, lowers the temperature immediately.) The first heat of the fuel is directed upon a mass of iron, which becoming red-hot, consumes the smoke passing over it: there are also "Welch lumps" to receive the direct action of the fire, and ignite the smoke passing by them. The furnace being supplied with uniform quantities of fuel in a divided state by means of the hopper and crushing-rollers, what falls upon the red-hot fuel is quickly inflamed, so as to produce but little smoke, and the fire is stoked without opening the door by means of a raker passing through a small hole, the furnace-man having the means of inspecting the progress of the fire through some small squares of talc, or Muscovy glass. Having said enough to explain the principles upon which this apparatus is constructed, we pass over the details, (some of which are unnecessary) and proceed to the description of his other plan, which is represented in the subjoined cut.

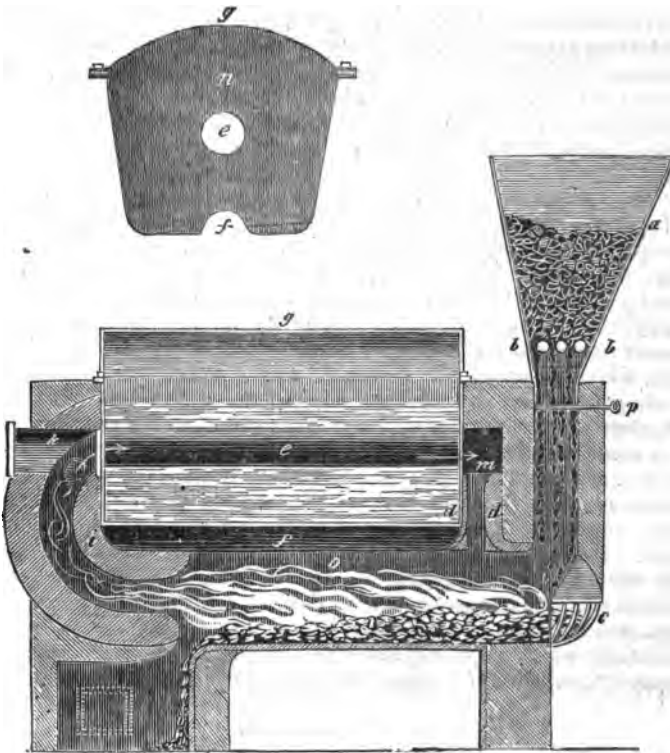


Fig. 1, exhibits a vertical section of a boiler and furnace :—*a* is the fuel-hopper to convey the coals into the front or side of the fire. *b b*, three iron rollers, to reduce the coals to a small size, and supply the fire with a uniform quantity as the consumption requires : *c*, is the front grating and only aperture for air ; the coals being always above the front bars, the air must pass through the fire and become heated. *d d*, a massive lump of iron, with a "return end," to receive the first heat ; and *m*, an aperture through the same, for flame to pass to assist and ignite the smoke that may pass through the internal flue, *e*. *f*, is the bottom of the boiler, and *g*, the top. The back flue, which leads through the boiler, is cast of great thickness, as shown by the piece, *i*, and that on the opposite side of the flue, the latter running through it ; *k*, the man-hole for cleansing the internal flue ; *p*, is a damper ; *s*, a door to the ash-pit made air-tight.

Fig. 2, is an end view of the boiler, the letters of reference thereon denoting the parts exhibited in the other figure.

ON THE MODE OF MANUFACTURING SALT BY EVAPORATION ON FAGGOTS.

By R. BAKWELL, Esq.

THE salt works at Montiers, in the Tarentaise, are particularly deserving attention, being perhaps the best conducted of any in Europe, with respect to economy. Nearly three million pounds of salts (including Glauber's salts, and the alkaline salts sold to glass manufacturers,) are extracted annually from a source of water which would scarcely be noticed, except for medical purposes, in any other country.

The springs that supply the rocks at Montiers, rise at the bottom of a nearly perpendicular rock of limestone, on the south side of a deep valley or gorge, through which the Doron runs before it to join the Isere. The distance of the salt works from the spring is nearly a mile ; the water runs in an open canal, but is received in a reservoir, where it deposits part of its vehreous contents. The water rises from the rock with considerable force, and emits much gas, which is principally carbonic, with a mixture of sulphurated hydrogen ; it has an acidulous and slightly saline taste. The temperature of the strongest spring is 99°. Fahrenheit ; it contains 1.83 per cent. of saline matter. The second spring has the temperature of 95°. and contains 1.75 of saline matter. Besides common salt, the water contains in small proportions sulphate of lime, sulphate of soda, and sulphate and muriate of magnesia ; together with oxide of iron. During the great earthquake that destroyed Lisbon in 1756, the salines at Montiers ceased to flow for 48 hours ; and when they flowed again their quantity was encreased, but the saline impregnation was weaker. It may seem extraordinary that the waters at Montiers, which have only half the strength of sea water, should repay the expence of evaporation ; but the process by which it is

effected is both simple and ingenious, and might be introduced with great advantage in many parts of our own coast, should the salt duty be entirely removed. The salt works at Bex, in the Pays de Vand, are nearly similar to those at Montiers, but not on so extensive a scale, and a very useful part of the process at Montiers is not adopted at Bex.

It is obvious that water so weakly impregnated with salt as to contain only one pound and a half in every thirteen gallons, could not repay the expence of evaporation by fuel, in any country. The water of the North Sea contains $2\frac{1}{4}$ per cent. of salt; and yet it has never been attempted, I believe, to make salt from it with coal fires, even on the coast of Northumberland or Durham, where refuse coal suited to the purpose might be purchased for 1s. 6d. per ton.

The first attempts at Montiers, in 1550, to make salt by atmospheric evaporation, was by arranging pyramids of rye straw in open galleries, and letting the water trickle through gradually and repeatedly. By this process a portion of the sulphate of lime was deposited on the straw, and the water became concentrated to a certain degree. It was then carried to the boiler, and further evaporated by fuel. In 1739, the present buildings were erected by order of Charles Emanuel III.

There are four evaporating houses, called Maisons d'Epines, (literally, houses of thorns). Nos. 1 and 2 receive the water from the reservoir and concentrate it to about three degrees of strength; viz. they evaporate one-half of the water they receive. These houses of evaporation are 350 yards in length each, about 25 feet in height, and 7 feet wide. They are uncovered at the top: they consist of a frame of wood, composed of upright posts, two and a half feet from each other, ranging on each side, and strengthened by bars across. The whole is supported on stone buttresses, about three feet from the ground, under which are the troughs for the salt water to fall into. The frame is filled with double rows of faggots of black thorn, ranged from one end to the other, up to the top: they are placed loosely, so as to admit the air, and supported firmly in their position by transverse pieces of wood. In the middle of each Maison d'Epines is a stone building, containing the hydraulic machine for pumping the water to the top of the building; it is moved by a water-wheel. When the water is raised to the top, it is received in channels on each side, which extend the whole length of the building: from these long channels it is made to pass into smaller ones by the side, from which it trickles through a multitude of small holes, like a very gentle shower, upon the faggots, where it is divided into an infinite number of drops, falling from one point to another. Being thus exposed to the contact of the air, it gains one degree of strength in falling, and by the action of the pumps it is raised again, and falls in other showers, till it acquires the strength required for passing to the evaporating house, No. 3. The process is conducted with less nicety in Nos. 1 and 2 than in the others.

The pumps moved by the machine in the centre of the building,

are distributed at equal distances on each side of the Maison d'Epines. The water is not always allowed to trickle down on both sides of the thorns, but only on that exposed to the wind. The two buildings, Nos. 1 and 2, are placed at different angles, to catch the different currents of wind that rush down the valley. No. 3 is constructed on the same principles as Nos. 1 and 2; it receives the water from them both; it is 370 yards long, and is *covered*, to preserve the salt water from the rain. There are twelve pumps on each side in this building, and more care is taken to distribute the water equally: here it is concentrated to the strength of twelve per cent., and deposits most of its remaining sulphate of lime in incrustations on the twigs.

The water being now reduced to about one-seventh of the original quantity, and raised to the strength of twelve degrees, is passed, along channels to the Maison d'Epines, No. 4: this is only 70 yards in length. Here it is further concentrated by a similar process, till it nearly reaches the point of saturation; but this depends on the season. In dry weather it is raised to 22 degrees; but in rainy, moist weather, to eighteen degrees only. In summer time the whole process of evaporation, in passing through the different houses, is about one month; in wet seasons it is longer. The stream of water that sets in motion the hydraulic machines for raising the saline water to the top of the buildings is brought by a small aqueduct from the river Doron. When once in motion, the process goes on, and requires little further attention, or manual labour, till it is completed. When the water is nearly saturated, it passes to a large building, where are the pans for boiling, and the salt is chrysallized in the usual method. That the reader may form an idea of the quantity of water evaporated before it comes to the pans, the following is a statement of the reduction at each of the evaporating houses:—

8000 hogsheads, when received at Nos. 1 and 2, contain about $1\frac{1}{2}$ per cent. of salt, reduced to 4000 lhds.

4000 hogsheads, when received at No. 3, contain about 3 per cent. of salt, reduced to 1000 lhds.

1000 hogsheads, received at the pans, contain near 22 per cent. of salt.

Thus out of every 8000 hogsheads, passing through the Maisons d'Epines, 7450 are evaporated by the air in summer, and about 7000 in winter; and only one sixteenth part of the fuel is consumed, that would be required for evaporating the whole quantity by fire.

The faggots are changed at periods of time from four to seven years. Those in Nos. 1 and 2, while the saline impregnation is weak, will decay sooner than in Nos. 3 and 4. In No. 3 all the twigs acquire so thick a coating of selinite, that when broken off, they resemble stems and branches of encrinites.

In the covered house, No. 3, there are twenty-four pumps, twelve on each side, to distribute the water more equally over the whole. This system of pumps is worked by joined bars of wood, which

move backwards and forwards, and are connected by crank wheels with each piston to raise and depress it. As I have before mentioned, they take care to evaporate on the windward side of the building. When I was on the top of No. 3, though the air was very warm, I felt an intense degree of cold, the consequence of speedy evaporation.

The total length of the Maisons d'Epines is as under:—

No. 1 and 2 together 700 yards, English.

No. 3. 370 do.

No. 4. 70 do.

1140 yards=*nearly two-thirds of a mile.*

The fuel used at the pans for the last process is partly wood, and partly anthracite from the neighbouring mountains. The anthracite answers remarkably well when once ignited, as it preserves for a long time a regular degree of heat. The consumption of wood was formerly so great that it has denuded many of the higher mountains in the Tarentaise, and exposed them to the action of the atmosphere, which has occasioned vast *eboulements*; for it is found that forests are of the greatest utility in preserving precipitous mountains from destruction. The fact is now well ascertained that the government has lately paid particular attention to the preservation of the wood. The quantity of salt made here annually is estimated at 100,000 myriagrammes, or about 2,250,000lbs. avoirdupois, and about 9000 myriagrammes of sulphate of soda, or about 187,000lbs. The other alkaline matters which adheres to the pans is sold to the glass-makers. The government receives on the average, 150,000 francs for the products, out of which it is estimated that 30,000 are expended for wood and fuel, 8000 for materials employed in the buildings, and for the faggots, &c., and 62,000 for the wages and the salaries of the different officers, leaving an annual profit of 50,000 francs. In some of the mountains of the Tarentaise, the gypsum is intermixed with the rock salt, *en masse*, and was worked by the peasants; but the places are now closed up, and so strictly guarded by order of the government, that I found it difficult to procure specimens.

These mines were formerly worked, the salt being separated from the gypsum by solution, and subsequently evaporated by fire; but the great *eboulements*, caused by clearing away the wood from the sides of the mountains, obliged the government to abandon the mines, and undertake the manufacture of salt at the Salines. These mines are mentioned by the Roman historians.—*Travels in the Tarentaise.*

AMERICAN PATENTS.

Specification of an improvement in the mode of making or forming Hat Bodies. Patented by HENRY F. WEST, and ANDREW H. STEVENS, Richland county, New York, Oct. 29, 1828.

First. A complete carding machine, with the exception of the

roller and doffer, the doffer being covered with filleting cards, which brings the wool from the machine in a continued web.

Secondly. This web alights upon a table, constructed for its reception, about five feet in length, and three in width, with rollers in each end, over which an apron passes, the rollers moving by a band, or by cog wheels, attached to the machine above described, with sufficient velocity to receive the web free from wrinkles, and without stretching it in the least, carrying it from the place where it first strikes, or alights, upon the apron, to the other end, perfectly smooth.

Thirdly. From this the web is taken, by a hat former, (this being the only part of the machinery herein described, which the petitioners claim as their invention, together with the manner of using the hat former, and the right of forming hats on the apron and table,) the hat former consisting of a board from three feet to four feet and four inches in length, and from 16 to 32 inches in width at the centre, according to the size of the hat to be formed; being tapered from the centre to each end, leaving the ends from 5 to 12 inches, which are made round, the board forming, from its dimensions or shape, two hat bodies, one at each end.

Fourthly. The web is wound upon this board, by laying the board, or former, upon the table, and rolling it onward, the apron advancing in the mean time: (the board may be previously covered with some kind of thin cloth, from the centre to the ends, which causes the web to cleave to the hat former, the cloth consisting of two pieces, one at each end:) the web diagonally covering the former on all parts, smoothly, as the workman wishes, who turns the former, standing at the other end of the table.

Fifthly. After the hat bodies are thus wound upon this board, or former, they are cut, or torn, in the centre, and taken from each end; the cloth may come from the former at the same time, and with the hat bodies, then be taken from them, and placed again round the hat former.

HENRY F. WEST,
ANDREW H. STEVENS.

Specification of an improved Top Press Roller, to be attached to the machine for Making Paper. Patented by MASON HUNTING, Watertown, Middlesex county, Massachusetts, Oct. 20, 1828.

1. The roller, or cylinder, may be made in the usual way and form, and of the usual materials, but of such a size or diameter as will give a sheet of paper of the required dimensions, by one revolution on its axis.

2. A slit or groove must then be cut in the roller, in a straight line, from one end to the other. This slit, or groove, may be from one quarter to half an inch wide, and from one to two or more inches deep. The roller thus constructed, will continue to receive the paper from the felt, when the machine is in motion, till it has revolved a sufficient number of times to give to the paper, or sheet,

any desirable thickness, when the person attending will, without stopping the machine, take the sheet from the roller, by applying his fingers to the sheet at the ends of the roller, at the groove, when it will separate along the groove; he will then take it off and place it upon the lay-stool, and in this manner continue the operation.

3. A small bell may be attached to the roller, which shall give notice to the person attending, when the same shall have performed the number of revolutions necessary to give the sheet the requisite thickness.

4. A knife acting on springs, may be placed within the groove to cut or separate the sheet at any given number of revolutions of the roller: or the sheet may be divided by passing a small circular saw, turning on an axis along the groove, by the person attending. It is, however, believed, that taking off the sheets from the roller, by hand, will be the best way.

By means of this improved roller, paper of any thickness may be made by a single and simple operation—where it has been heretofore necessary that a number of thicknesses, or sheets, as they come from the mould, should be pressed together to form one solid sheet or mass; such as paste-boards, playing cards, press papers, book-binders' boards, sheathing paper, &c. &c.

MASON HUNTING.

Specification of an improvement in Felloes of Wheels, for Trucks, Carts, Wagons, Coaches Chaises, and all kinds of Wheels ordinarily made use of for transporting loads, for pleasure or business. Patented by GEORGE ANDREWS, Tolland, Connecticut, October 24, 1828.

THE rims, or felloes, are to be made of cast-iron, and may be cast whole, or in pieces or segments.

The rims, or felloes, if cast whole, may be used with or without a band or tire, and must be cast with a mortise, open in one side, to receive the ends of the spokes, with a groove to receive a slide to fasten the spokes into the felloes. The slides are to be made of wrought iron, and fastened to the spokes by a bolt, or screw.

The felloes, or rim, to be made with swells where the spokes enter them. The segments are put together and united by a tenon and mortise at the ends, with a small space at the ends of the tenon sufficient to receive a bolt to hold the band, or tire. The felloes should be cast with swells in them, where the ends of the segments meet, and a similar swell where the spokes go into the felloes; those swells are designed to give more strength to the wheel. The shape of the felloes may be varied to any that may be wished.

The peculiar excellence of this kind of felloe, is, that it is more durable than wood, not being subject to rot, or decay, by being used, or exposed to the weather; and will remain good as new ones, when the spokes and other parts of the carriage which are made of wood, shall be wholly demolished by age and use, and can be easily ob-

tained when suitable timber for felloes cannot, and can be afforded equally as cheap as those made of wood. GEORGE ANDREWS.

Specification of a mode of making Weeding and other Hoes.
Patented by JAMES A. BLACK, Columbia, South Carolina, Oct.
13, 1821.

An anvil with a face ten or twelve inches, by twelve or fourteen inches on the face, on which the size of the blade of the hoe is sunk, nearly as deep as the hoe blade is thick, with also the thickness of the eye of the hoe spread out flat, sunk in the same. From the centre of the blade to the middle of the eye as thus spread out, the anvil is still deeper sunk, so as to receive the ridge extending from the centre of the blade to the eye of the hoe when made. On this anvil a tilt or trip hammer works, with a face large enough to cover both blade and eye as extended or spread out. This hammer is put into motion in the usual way as now practised in forging iron. The hoe is made from a bar of iron about seven-sixteenths thick, and four, or four and a half inches, wide. The bar is heated and laid on the anvil, the end extending to the edge of the blade, or nearly so, and passing back over the centre of the eye. The action of the hammer forges the iron down into the sunk part of the anvil, until the iron begins to spread over the high part of the face of the anvil, and is made of a proper thickness for a hoe. In this part of the operation, the back part of the blade and the inside of the eye are up next the hammer; the upper side of the blade and outside of the eye next the anvil. The hoe is then trimmed by a pair of shears, such as are used by tin-plate workers, down to the impression made by the sink in the anvil. These shears are worked by a crank on the same shaft that gives motion to the tilt hammer. The hoe is then heated, and the blade part fastened in a vice made for the purpose; one jaw of the vice is flat; the other is formed so as to receive the ridge on the face of the hoe, and the upper part sunk or indented so as to fit the round of the eye. While the iron is at a proper heat, it is turned down to the front, and swedged in to the last described jaw of the vice, so that the eye is brought to form a square with the blade. Then the two wings which form the eye, are turned over so as to lap one over the other on the back, or pole of the eye, at which place they are welded at a subsequent heat and operation. What is claimed as new and an improvement in the art of manufacturing weeding and other hoes, by this method, is forging the blades and eye at the same operation, with a tilt hammer, at which time, one side of the hoe and eye is perfectly flat, the other only varied by the different thicknesses required. From this shape, the hoe is completed by squaring the eye to the front, and turning the wings so as to meet and lap over. There are many operations in use, which have been, heretofore, practised.

JAMES A. BLACK.

FIG. 1.

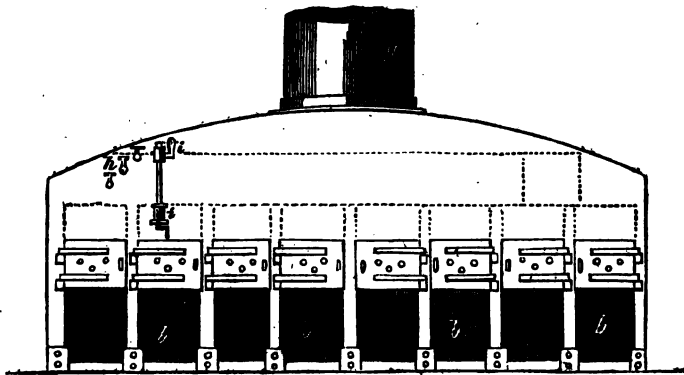


FIG. 2.

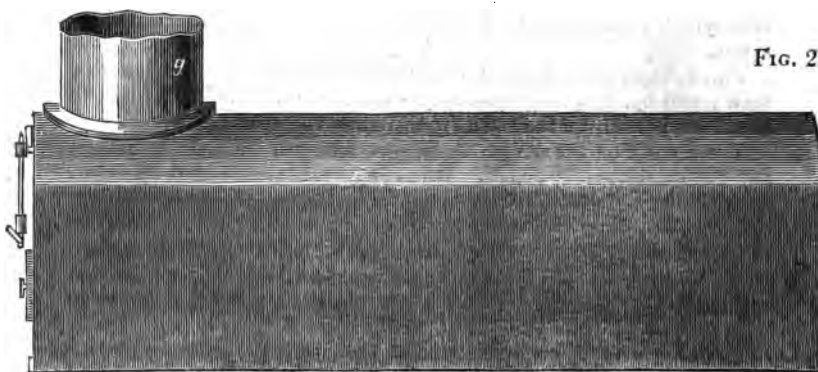
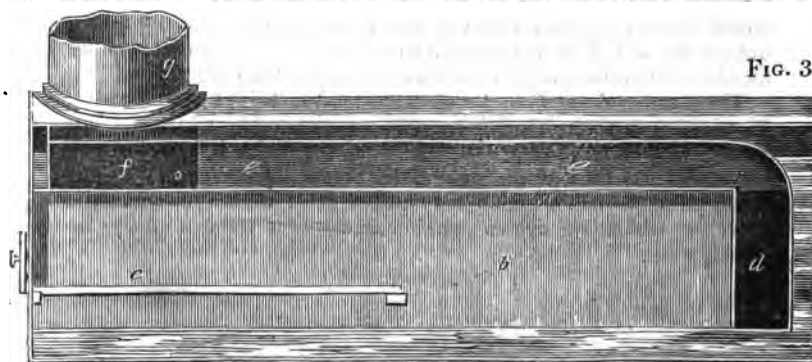


FIG. 3



THE UNITED KINGDOM STEAM BOAT BOILER.

TO THE EDITOR.

Glasgow, 19th June, 1829.

SIR—It has been a matter of surprise and regret to me that a mechanical description of the United Kingdom steam-boat has never yet been published, and as it lies in my power to afford some particulars of this noble piece of mechanism, I am anxious that it should find a place in your invaluable work, which I have taken in from its commencement.

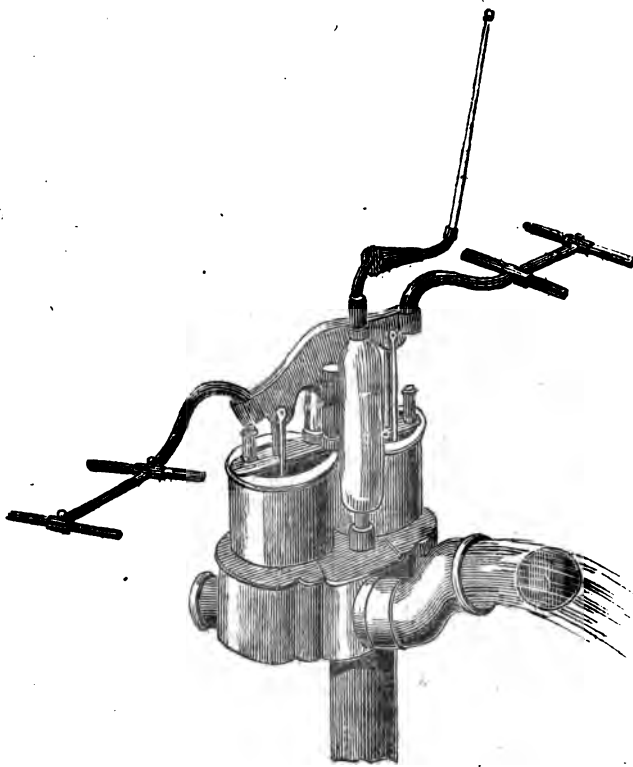
The United Kingdom is the largest steam packet ever constructed in Britain, her burthen being calculated at 1000 tons. Her length is 148 feet, breadth of beam 45 feet, and she is propelled by two engines, each calculated at one hundred horses' power; these were constructed by my eminent townsman, Mr. Napier, and are considered by engineers to be the best engines ever put into a steam-boat. I am in expectation of being able to furnish you with drawings of them, but for the present I must be contented with sending you a description of the immense boiler only. The drawings which I enclose, are on a scale of one-sixth part of an inch to a foot.

Fig. 1, represents a front end view of the boiler; fig. 2, a side view; and fig. 3, a longitudinal and vertical section; the letters of reference in each that are the same, indicate similar parts.

The length of the boiler is 25 feet, breadth 19 feet 6 inches, and the height nearly 9 feet. It is completely surrounded by water, with the furnaces and flues in the interior; these are represented at *b, b*, and are eight in number, each of them being 5 feet 3 inches in height, and running the whole length, (25 feet) of the boiler. In the upper part of each of these tubes, the furnaces are placed as represented by the eight doors above the dark spaces, the bars to which, whereon the fuel is placed is shewn in the section fig. 3. Each of these tubes communicates at their furthest extremity, with a transverse flue *d*, (extending the whole breadth of the boiler) which opens into other tubes *e*, above the former, and return the heated air and flames to the front of the boiler, from whence by another transverse flue *f*, the smoke &c. enters the chimney *g*.

There are cocks at *h, h*, for ascertaining the height of the water. In addition to these, there is another contrivance by which the use of the former may be dispensed when the latter is in order. A strong vertical tube of glass communicates with two cocks *i, i*, one being placed as much above the proper level of the water as the other, by which it is evident, the level of the water will always be exactly seen.

(To be continued.)

**PATENT SHIP'S PUMP.**

By GEORGE CLYMER, of Finsbury.

THE following account, (we cannot say *description*) of Mr. Clymer's curious pump, has been sent to us for publication by a gentleman concerned in the patent. It is contrary to the plan of this work to publish a mere prospectus of an invention without explaining its construction, and we should here venture to unveil the apparent mystery, had not the gentleman who sent us the account, promised us also a *section* for publication. We can imagine an arrangement of parts by which such large and heavy substances as 24lb. cannon-shot, are raised and discharged by pumping, but we prefer waiting a little longer for the exact explanation promised, to offering our own plan for the purpose. The prospectus states that the properties of the machine to consist:—

First—As a ship's pump, raising more water by an equal power than any other now in use.

Secondly—It is not liable to be impeded or obstructed by such substances as impede, obstruct, or choke all other ship's pumps. It will not only raise and discharge all kinds of grain, corn, sand, gravel, ballast, stones, &c. ; but, although the present pump is made on a very moderate scale, it will raise four hundred gallons of water per minute, and disgorge 18 and 24lb. shots in rapid succession, or any other substances which come within the draught of its powers, and does not exceed the diameter of a 24lb. shot, together with the water: and they may be made on a more extended scale, so as to raise double the quantity of water, or even more, and substances of a proportionate size.

Thirdly—From its peculiar construction, simplicity, and strength, it is not liable, but almost impossible to be injured by the roughest usage.

Fourthly—Those parts which are most exposed to injury by use, can be easily and quickly repaired, because they are all in sight, and within hand-reach.

Fifthly—In a few seconds it is convertible into a most powerful extinguishing engine, and may be used as such on all occasions where an engine is requisite on board ship. When thus used, the water is of course drawn from alongside, and may be driven in torrents through and over every part of the ship, even over the mast-head.

Sixthly—It is likewise as quickly converted into a syphon, by which immense torrents may be made to descend from alongside into the hold; and if conveyed by branches or tubes, fore and aft, and discharged at each extremity, will drive the bilge-water before it into the mid-ships, where it is quickly pumped up—thus keeping a continual supply of pure water in the hold, instead of a stagnant bilge-water, from which arises those noxious, pestilential, and corrosive exhalations, which not only injures the cargoes and inconvenience the passengers and crews, but destroy the very materials of which ships are composed.

PATENT SAFETY APPARATUS FOR CARRIAGES.

By T. RILEY, of Union Street, Southwark, 1839.

THE object of this invention is first to afford the means of instantly liberating the horses from a carriage, when they have become unmanageable, and afterwards for checking the momentum given to the vehicle.

A splinter-bar is fixed to the carriage by means of iron straps; the pins to hold the traces are not as usual *fixed* to the ends of the splinter-bar, but to an iron frame below it, from whence they slide or pass through the splinter-bar, into another iron frame above the bar, the pins holding the traces between the two latter. When

therefore the lower frame is raised, (which is done by simple levers) the pins rise and secure the traces, and on causing it to descend, the pins are drawn down, and the traces are released. To prevent the fore-wheels of the carriage from locking under, when the horses are disengaged from it, a pin at the back of each of the levers rises, as the frame descends, and passing through the fatchels, enters the wheel-plate and prevents the fore-carriage from turning.

For checking the impulse given to the carriage when the horses are released, a faction band is made to press upon the nave of one of the hind wheels; at the same time a "tumbler catch" is thrown into a groove in the nave of the wheel, in which there is a notch for the catch of the tumbler to fall into, and stop the revolution of the wheel.

The levers to produce these effects, may by cords and pullies be put into operation either by the coachmen, or persons riding within the carriage.

AGRICULTURE

UTILITY OF MOLES.—An article from the pen of Mr. Hogg, in the Quarterly Journal of Agriculture, advocates the cause of moles, and insists that they are of the greatest benefit, instead of being prejudicial to the ground. The mould they throw up serves, says Mr. Hogg, as top dressing, and is of great advantage to grass lanes. Even should the farmer neglect to spread the mole-hills, the crow and the lambs will do it for him. The writer also contends against the notion, which he treats as an unfounded prejudice, that the moles destroy the drains. In support of his defence of the moles, Mr. Hogg refers to the consequences of their destruction on the estates of the Duke of Buccleugh. He maintains, that on all the farms that were most overrun with moles, the stock has become reduced at least one-sixth, in some instances one-fifth; and not only that, but two exterminating diseases have been introduced, the pining and the foot-rot, which in some seasons, have nearly annihilated the stocks on these farms as well as the substance of the men who possess them. The tenants of the duke, it appears, are so sensible of the detriment done to these soft lands and to their stocks by the extirpation of the moles, that two bodies of them have joined in a head, one in Ettrick forest, and one in Tiviotdale, in order to petition their young chief to spare the remnant of their old friends the *nowdies* and suffer them to breed again.

LEAVES OF SCORZA NERA AS FOOD FOR SILK WORMS.—The leaves of the Scorza nera have been used with success in the nourishment of silk worms by Mademoiselle Coge, of Epinal. The silk gathered from worms fed on this leaf, is represented to be in no respect inferior to the material furnished by worms fed on mulberry leaves.—*Bull. Univ.*

LONDON MECHANICS' INSTITUTION.

ON Wednesday last Mr. Smart commenced a course of Dramatic Readings, with remarks on poetry, oratory, &c., in the Theatre of the London Mechanics' Institution. It is, we understand, the intention of the committee of management to introduce during the summer season a series of lectures on various branches of literature, which, it is conceived, will form an agreeable relief from the numerous lectures on science that are delivered in the Institution during the rest of the year.

Mr. Smart commenced his lectures with some remarks on the importance of a just and graceful elocution, which he observed must not be considered in the light of a mere accomplishment, but as a highly valuable auxiliary to the acquirement of literary knowledge. After a few other remarks on the connection between poetry and oratory which he considered, in spirit, to be the same, he proceeded to give specimens of the different kinds of eloquence by reading the most interesting passages of Shakspeare's play of Julius Cæsar, and explaining the intermediate parts so as to exhibit a connected view of the whole play, which he observed was exceedingly well adapted for his purpose from the variety of style which it included.

Mr. Smart concluded his reading by personification of several well-known characters of Shakspeare's, in which he was highly applauded by a numerous and attentive audience.

The introduction of lectures of this description, by a gentleman of such deserved reputation as Mr. Smart, may be considered as a new and valuable feature in the Mechanics' Institution, as it will furnish many with an opportunity of hearing the whole of Mr. Smart's lectures, together with the other advantages of the Institution, for a sum not much exceeding that which must elsewhere be paid for the hearing of one lecture.

INDEX.

A.

Acid, Hydrocyanic,	14
Adam's patent domestic spinner	12
Adulteration of bread with fluor, spar, and granite, observations upon,	45
Agriculture	373
Ærolite, fall of.	80
Air, engine, Tippet's patent,	81
pump, by F. Elliot	263
trap for foul air	265
Allen's patent thrashing machine	310
Alum, Strachan's patent for making,	24
Amber, formation of,	190
Animals, neutralization of,	158
haymakers,	160
Antiquities, study of, in Russia	349
Animals, marine effects of fresh water on,	350
Apparatus for gas	335
Apparatus, Jones's patent igniting,	358
Neilson's patent blowing,	301
Astronomy	15
Atmospheric engine, Talbot's,	10
Austrian patent for preparing manure	140
Archery, French statutes of,	354

B.

Barrels, Goodall's patent machine for making,	8
Barometer, improvement in,	12
Bayrd's patent ship's way meter	28
Barron's patent furnaces	69
Barometer, animal,	176
improved one	247
Dr. Wollaston's (new)	331
Bedstead, Wilbur's patent drum sack- ing,	9
Bedstead, Breidenback's patent,	50
Bell's patent filterer	347
Bees, curious fact concerning,	349
Bleaching, remarks upon,	356
Beet-root, observations on the sugar from,	342

Bernhard's patent hydraulic machine

	161
Beds, patent for,	51
Bee-hives, Nutt's improved,	228
Bottles, Bille's patent for washing, corking, and filling,	311
Bombas's patent propelling apparatus	23
Boots, Laporte's patent cloth for,	43
Book, review of,	205
Bridge, suspension, by de la Fons	197
Brick striker, Duty's patent,	8
Mencke's patent machinery for making,	301
Brownills patent mode of transferring vessels from one elevation to another	33
Breidenback's patent bedstead	50
Bratt's lath sawing machine	52
Bread, on the detection of adultera- tions in,	69, 126
Brick and tile-making American patent press	321
Bridge, new iron,	286
Brown's patent machinery for weaving	340
Brunton's patent for coal gas	280
Brushes, patent shaving,	165
Brooking's patent method of making sails	301
Bullman's patent washing and wringing machinery	290
Buoy's improved machinery	328

C.

Castor's salt's, patent swivel,	227
Caney's patent umbrellas	200
Cash machinery, Hale's patent,	11
Cannons and rockets, improved,	303
Casey's patent surgical instrument	11
Camelion mineral	10
Capstan, Hindmarsh's patent,	83
Calefactor	265
Cat blocks, Bothway's,	225
Canal of the Netherlands	79

INDEX.

Canal towing wheel for canal boats	209	Duty's patent brick striker	8
Carman's patent for feeding horses	325	Duxbury's patent for splitting skins	337
Carman's improvement on horses	315	Dyeing, important improvements in	100
Carriages, patent,	257	E.	
Cartridges, Jenour's patent shot,	102	Ear trumpet, Hancock's flexible,	202
Calculation frame	263	Earth, magnetism of the,	298
Canal gates, American patent improvement in,	326	Education of Spanish Refugees	320
Cement, fusible,	254	Elephant, superior intelligence of the,	144
Chain cables, American patent for proving hemp and chain cables,	324	Electricity	190
Chair, Morris's somnolential,	227	Elder tree, manifold properties of	340
Chart, improved (sea)	203	Enquiry respecting steam engines	85
Churchyards, ornamental,	174	Eubank's patent machine for feeding cotton gins	43
Children, evil consequences of rocking,	160	Europe, increase of the population of	272
Chinese mode of planting	14	Evans's patent sea table apparatus	326
Chains, Hawks's patent	132	F.	
Chronometer, Ulric's patent,	110	Fawcett and Clark's patent for refining sugar	115
Chlorine	303	Farish's patent mode of clearing water courses	346
Cinnamon, cultivation of,	222	Female, degree conferred,	191
Compass, Langley's patent mariner's,	6	Felton's patent machine for thrashing	42
Cotton gins, Eubank's patent machine for feeding,	43	Feathers, method of cleaning	168
production of,	111	Fire, Deane's apparatus for entering houses in flames	224
Corn shelling machine, American patent,	52	Fire Escape Society	170, 173
Coffee, wholesomeness of,	319	Fire escapes, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189	
Comets (expected)	63	Fish, natural stocking of,	58
Enckes	63	Filtering machines, various,	347
of 1811	111	Fire screen	16
Cochineal insects	80	Fluor spar, on the Derbyshire,	45
Coast light on a new principle	348	Fleas, propagation of,	191
Cosmophere, Muller's patent,	196	Flooring machine, Muir's patent,	66
Condensers, Wheeler's patent,	199	Food, on the improvement of,	154
Coffee trade at Antwerp	349	economy in horses	223
Cologne and Bonn, population of	332	Freeborn's patent tube joints	26
Coffee pot, Jones's patent	233	Friction, Rennie upon,	218
Cochineal plant	304	Fraser's patent steam boiler	49
Coach, new,	288	Fruit, preservation of,	160
Crane, Revis's patent for raising weights,	120	Barrenness of fruit trees	192
Coinage of gold	272	Furnace, Losh's patent	237
Code, copy of the Budisht,	219	Furnace for melting iron	139
Cutlery, Smith's patent mode of manufacturing,	84	for boiler	139
Cylinders and retorts, Horton's patent,	3	for consuming smoke 136, 137 151, 165, 207, 234, 251, 260, 359	
D.		patent smelting,	105
Deane's patent apparatus for entering houses, &c., on fire	234	Barron's patent,	69
Disorders, non-existence of hereditary,	222	Gilbertson's patent,	99
Distilling apparatus, Fredonias,	10	American patent, for generating steam by Anthracite coal, and for various manufactures requiring intense heat	305
in vacuo	133	which consume their own smoke 165, 136, 151, 207, 251, 260, 359, 329, 217, 275, 291	
Dickenson's patent mattress	51	Fuel, substitute for domestic,	62
Dog, superior intelligence of the,	144		
Dragon Flusinnocuous	176		

INDEX.

G.		Increase of bulk in cast iron, by successive heatings	302
Gas, economy in the use of,	221	On an improved mode of making bar iron, by the editor	321
Galvanic apparatus, improved,	253	Inkstand, floating,	204
Gas, patent improvements in manufacturing,	286	Instrument, surgical, Casey's patent	11
Generator, Manby's patent steam,	14	Institutions, scientific, procedures of	29, 57, 204, 220, 240, 336
Geology	31	Indian mode of fishing	333
Anti-convulsive system of	269	Infants, on the mortality of	288
Globe, terrestrial, by Addison	262, 263		
Goodall's patent machinery for making barrels	8	J.	
Gooseberries	80	James's patent steam carriage	213
Gordon on sea walls, &c.	316	Jenour's patent shot cartridges	102
Grenade percussion, hand,	235	Jenar's patent metallic linen	13
Greenleaf's patent water wheels	7	Jones's patent igniting apparatus	358
Grail's patent grist mill	10	Judge's patent for chain cables	324
Grain, Nourse's patent machine for thrashing,	42	Jones's (Dr. T. P.) remarks on American patents	6
preservation of,	223		
Grosjean's patent corn shelling machine	52	K.	
Griffith's patent steam carriage	131	Kallifthorgan, a new musical instrument,	284
Gravitometer, Captain Forman's,	134	Keels, Shuldham's sliding,	212
Grain and seeds, preparation of, by chlorine	143	King's patent improvement in canal gates,	326
Grub worm	158	Knife, Harrington's patent carving,	11
Gravel walks	144	King's ships at present building, launched during 1828, 333	
Gilbertson's patent furnace	99		
H.		L.	
Hat bodies, American patent,	314	Latch, improved,	265
Hale's patent cask machinery	11	Langley's patent mariner's compass,	6
Harrington's patent carving knife	11	Lamb's circular proportioner,	17
Haddock's patent paper machinery	28	Lath machine, Rice's patent,	43
Hammers, cast iron, Jones's patent	52	Laporte's patent cloth for boots,	43
Hancock's aquatic dress	113	Lath sawing machine, Bratt's patent,	52
Hawk's patent cable and hawser chains	132	Latlap, Albion,	254
Hancorne's patent for nail making,	285, 344	Lever, prize essay on,	58
Hail-stones, composition of,	144	continued, 71, 87, 103	
Harp, Grosjean's,	203	concluded,	118
Heat communicated by the circulation of hot water	335	Lithography,	303
Heat, new method of applying,	243	essays upon,	277
Hindmarsh's patent capstan	83	Linen, Jenar's patent metallic,	13
Horton's patent cylinders and retorts	3	paper,	63
Howard's patent rail way carriage	293	use of chameleon mineral for marking,	16
Horses, white hoofs in,	174	Lime, muriate of,	303
American patent for improving the shape, carriage, action, and power of, by feeding them	315	Light, intense,	64, 143
Howell's patent for a superior method of manufacturing iron	853, 305	Harley's apparatus,	203
Hydraulic engine, marine self-acting,	312	Liquors, improved mode of drawing and corking,	297
I.		Liquors, concentration of spirituous,	325
Iron, American patent for an improvement in, and an improved bloomery furnace	353	London Journal of Arts, chemical science of the	43
		Longevity,	303
		Lungs, danger of artificial inflation,	190

I N D E X.

M.	
Manby's patent steam generator,	14
Mattresses, Dickinson's patent,	51
Manure, Petre's Austrian patent for preparing,	140
Mariner's compass, improved mode of fixing,	6
Mangle, Brook and Webster's improved,	232
Meter, Bayrd's patent ship's way,	28
Metals, conducting power of,	81
Measles, sulphur a security against,	303
Melville's patent for propelling vessels,	241
Meat, tender,	160
Microscope, review of work on,	205
Mill, Grail's patent grist,	10
Miller's patent for setting stills,	11
Miller's patent ships' ways	25
Mill, Murray's patent,	25
new tide and flood-gate,	97
mechanical horse driver,	189
Monuments, destruction of Egyptian,	382
Mornay's patent process in smelting ores,	147
Molecules, supposed existence of in mineral substances,	287
Muller's patent cosmosphere,	196
Muir's patent flooring machines,	66
Musical glasses without water,	255
N.	
Navigation, on the inapplicability of steam to canal,	248
National Repository, 193—204, 225—229, 230, 232—235	
Nails, patent method of making,	285
	344
Needles, magnetic,	14
Negroes, capacity of,	150
Neilson's patent blowing apparatus,	301
Nelson's patent wringing machine,	315
Nourse's patent machine for threshing grain,	42
Nopal, or cochineal plant,	304
Norman's patent plough,	809
O.	
Observations on the incrustations of steam boilers,	267
on the boilers of steam engines,	93
Ore's patent process in smelting,	147
Orson's patent for an improved cart-ridge,	286, 344
Ornaments, ancient,	332

Ox gall, on the preparation of colourless,	282
process for depriving it of its putridity,	288

P.

Parasol, Crawford's patent,	199
Paper machinery, Haddock's patent,	28
Paddle wheels, experiments with Skene's,	47
Patents sealed, list of, 16, 112, 224, 304, 352	
American patents granted in July, 1828,	41
Patents, list of expired, 32, 96, 144,	192
Patents enrolled, descriptive list of,	334, 338
Patents, French mode of punishing invasion of,	383
Patents, American specification of,	365
	—368
Paper, American patent for making of, made from Indian corn,	315
Pattison's patent iron sheathing,	236
Payne's patent weighing machine,	215
Parker's patent brick and tile press,	326
Pen, improved one for drawing,	163
Peterson's patent improvements in casting types,	341
Pendulum,	175
Hardy's spring,	197
Piles, apparatus for driving,	911
Pistons, observations on the various metallic pistons,	19, 37
for steam engines, by the Editor,	37
Pianoforte, Rolfe's,	308
Platinum, fusion of,	190
Plough, patent hill side,	309
Planting, Chinese method of,	15
Pneumatic engine, marine self-acting,	313
Potato, everlasting,	223
Post's patent washing machine,	27
Powell's patent moulds for sugar leaves,	35
Potash, new use of the chromate,	30
Powder, fulminating,	143
Potash, from potatoe tops,	169
Chrystallization of the sulphate,	173
Press, patent copying,	177
Propelling apparatus, Bombas's patent,	23
Tippet's patent,	114
Plan for making use of the tides to propel machinery,	97

INDEX.

Melville's patent,	241, 334	Singalese and Pali books,	219
Press, Reilly's self-registering,	201	Silver and copper, separation of,	31
Ritchie's patent copying,	177	Silk, Morris's method of cleaning,	85
Prism, musical,	173	vegetable origin of,	111
Printing, extraordinary,	256	Skene's patent paddle wheels,	47
Pumps, Underwood's common,	41	Skins, Duxbury's patent method of splitting,	337
Chain,	211	Slugs, preservation of plants from,	319
Udny's patent self-working,	289	Smith's patent cutlery,	84
Pyrometer, new,	288	Smoke consuming furnaces, 136, 137, 151, 155, 207, 234, 253, 260, 259 consuming register stove,	260
R.		Society, French,	349
Rattlesnakes, danger from,	271	Soil, raising of, in Egypt,	276
Razor straps, new,	41	Somers' patent smelting furnaces,	165
Railway carriage, Howard's patent improved,	293	Spine supporter, Shoolbred's patent,	254
Rail-road in France,	271	Spoon, Gibson's medical,	202
Reed's patent washing machine,	9	Spirits, patent mode of extracting,	150
Recker's patent means of transport,	42	Sperry's patent saw frame,	10
Revis's patent crane for raising weights,	120	Spinning machinery, Walker's patent,	12
Register, patent duty,	14	Spinner, Adams's patent domestic,	12
Rennie on the friction of various substances,	218	Sprague's patent paper,	315
Repulsion, indicator of,	254	Steam engine, Tippet's patent, enquiry upon,	85
Rhubarb, analysis of,	222	model of,	263
Rhodes's patent for spinning,	286, 346	Udny's patent,	273
Rice's patent lath machine,	43	Steam carriage, Griffith's patent, James's patent,	213
Ritchie's patent copying press,	177	Steam boilers, Frazer's patent, Tippet's patent, Udny's Patent, United Kingdom,	370
Rice, use of,	270	Steam boilers, on the setting of construction of,	93
Roots,	128	boats, Steven's paddles for,	76
Rollers, engraved printing,	86	Skeene's ditto,	80
Rouge, new vegetable,	110	proportion of power to velocity in,	319
Roses,	143	Straps, new razor,	15
ottar of	175	Stone, immense block of,	63
S.		Stove, Watertown's patent,	9
Safety apparatus for carriages, Riley's patent,	372	Stills, Miller's patent for setting,	11
Salt, on the mode of manufacturing, by evaporation on faggots,	362	Strachan's patent for making alum,	24
Salt, source of in sea water,	143	Staple's patent plough,	309
manufacture of,	327	Stave machine, Benton's patent,	26
Saw frame, Sperry's patent,	10	Streets, on water pipes in the,	5
Sails, Brooking's patent method of making,	301	Stethoscope, the, or chest inspector,	142
Safety valves to steam boilers,	116	Steel, on the hardening of,	142
Screen, fire,	18	Stones that will resist frost, mode of discovering,	351
Scaly's patent window blinds,	26	Stone, immense block of,	63
Screws and screw presses, friction of,	143	Sugar loaves, Powell's patent moulds for,	35
Sea, saltness of the Mediterranean,	336	Fawcett and Clark's patent for refining,	115
Shoolbred's patent socks,	254	Potatoes obtained crystallized,	349
patent spine supporter,	254	patent process on preparing raw,	115
Sheathing, Pattison's patent iron,	236	Sun, spots on the,	221
Ship-worm, the,	271		
Ships' greens, improvement in raising,	12		
Ship's pump, Clymer's patent,	371		
Ships' ways, Miller's patent,	25		

INDEX.

Sun-dial, curious,	272	ging and furniture complete	282
Sulphur a security against the measles	303	Vacuo, distillation in,	133
Sweet and bitter, components of,	271	Vegetables, poisoning of,	64
T.		To make kitchen vegetables	318
Tobacco-cutting engine, patent,	1	tender	318
Tallow, on the fusion of,	48	dead leaves a protection to	
Table, patent sea apparatus for,	326	the roots of,	272
Tanning, new bark for,	360	Violet, medicinal qualities of the,	111
Talipot, use of the leaves,	219	W.	
Tea, cultivation and preparation of, in		Wright's patent tobacco engine	1
China	141	Water-wheels, Greenleaf's patent	7
Theatre, Roman, at Orange in France	351	Washing, Reed's patent machine for,	9
Temperature, subterraneous,	175	Bullman's ditto	230
measurement of high.	302	Watertown's patent stove	9
Thrashing, Allen's patent machine for	810	Walker's patent spinning machinery	12
Thrashing, Felton's patent machine for	421	Washing machine, Post's patent,	27
Time pieces, Pacey's triennial,	210	Walnuts, red colour from,	35
Tippet's patent air engine, steam ditto		Water, observation upon purifying,	55
patent engine and boiler	81, 82	Watt's patent furnaces	137, 139, 140
propelling apparatus	14	Water, Bernhard's patent machinery	
Tooth drawer, Skene's,	201	for raising, to great heights	161
Tree, vital parts of,	174	discharging, from Loch Lo-	
Transport, Reeker's patent mode of	42	mond	176
Tube joints, Freeborn's patent	26	clearing of water-courses	285
Tunnel in Lancashire	63	necessity of, to the vegetation	
Turtle fossil	125	of seeds	320
Type, American patent for an improve-		arrangement of, in the streets	5
ment on a machine for casting		Watch, Hervey's alarum,	201
printing types	341	Wax, patent improvement in the making	
U.		of stick sealing wax	285
Ultramarine, artificial production of,	28	Walls, (sea) piers, and break-waters	
Umbrellas, Caney's patent	200		316
Udny's patent steam engine	273	Wason's patent sealing wax	347
patent sea steam engine		Weighing machine, Payne's patent,	215
governor and self-working ships'		Weaving, American patent for an im-	
pumps	289	proved mode of making wire	
patent steam revolving engine	345	harness for weaving	340
V.		West's patent for making hat bodies	
Valves, safety, observations on, by the			314
Editor	116	Wheels, Skene's patent paddle wheels,	
Valve, a simple, cheap, and safety one	246	experiments upon	47
Vapour engine, bituminous,	102	towing, for canal boats, and	
Vaccination in London	319	steam tugs, by A. Christie	209
new mode of,	349	Whiskey, manufacture of,	224
Vessels, patent mode of transferring,	33	Wilbur's patent drum sacking bed-	
Piscian method of propelling,		stead	9
patent improvements in do.	241	Window sashes, spring rollers for,	18
fine model of, with all her rig-		Window blinds, Sealey's patent,	26
		Wilson's patent for extracting spirits	
			150
		Wine bottles, new method of stopping	
			174
		Woodman's patents shaving brushes	165
		Wringing machine, Nelson's patent,	
			315
		Y.	
		Yellow Fever	190
		Z.	
		Zoology	175



